

Running head: SECONDARY PREVENTION OF DIABETIC FOOT INJURY

A Transcultural Nursing Approach to Secondary Prevention of Pressure-Related Foot Injury in
Micronesia Migrants in Hawai'i with Type 2 Diabetes Mellitus

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Abstract

The newest members of the State of Hawai'i come from Micronesia under provisions of The Compacts of Free Association (COFA). In Micronesia, COFA citizens face unique challenges as a result of their association with the United States including the legacy of nuclear testing along with ongoing damage as a result of rising sea levels with saline leaching making land uninhabitable as the total land mass is diminishing. COFA citizens have the legal right to come to the United States and they are coming for educational opportunities, employment opportunities, and for health care. In Hawai'i, the Micronesian population has been met with prejudice, injustice and neglect.

The health care issues of Micronesia include both the communicable diseases of a developing area as well as the noncommunicable diseases of a developed region including type 2 diabetes mellitus. Poverty, lack of natural resources, poor nutrition, and a sedentary lifestyle promote both communicable and noncommunicable diseases in this vulnerable population. Migration to Hawai'i provides opportunities to receive education, employment, and health care not available in native lands.

The high prevalence of type 2 diabetes in COFA migrants presents many opportunities to pursue secondary prevention measures in this population. In the Micronesian population traditionally, as is common in tropical climates, footwear is minimal or nonexistent leaving feet exposed to injury. The overarching goal of this project was to address one aspect of secondary prevention in the Micronesian migrant population residing in East Hawai'i, preventative foot care in the diabetic. With the aid of a cultural interpreter a pilot study was conducted with participants surveyed as to footwear preferences. With the expert advice of a podiatrist and the guidance of the cultural interpreter, prototype safer alternatives to commonly worn footwear

were developed. The prototypes were trialed over a one-week period after which a secondary survey was performed. Of the prototype trial participants, 100% liked the shoes, wore the shoes, and desired to keep the shoes.

Cultural adaptations are required for successful promotion of self-management of chronic conditions including obesity and diabetes. Collaboration with COFA stakeholders will afford better outcomes for Micronesian citizens. To date, the healthcare community has failed to engage this population largely due to Western medicine ethnocentrism and paternalism. This pilot study demonstrated the willingness of the Micronesian migrant community to partner with healthcare providers for rational lifestyle changes to improve overall health.

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CHAPTER ONE

Statement of the Problem, Aims and Objectives

In the increasingly multicultural United States, cultural competence has become a critical component of healthcare. According to Leininger (2008), “Culture is the broadest, most comprehensive, holistic and universal feature of human beings.” Transcultural healthcare involves caring for clients with different worldviews than that of the practitioner. In the state of Hawai’i, the county of Hawai’i is home to one of the most diverse populations in the United States. In the context of providing healthcare to Micronesian migrants in rural Hawai’i County, four distinct cultures are intertwined; (1) the Micronesian culture, (2) the modern American healthcare culture, (3) the modern American culture, and (4) the multicultural phenomenon in this geographically isolated region known as “mixed plate” or “living local” (Riker, 2015). Chapter One provides background regarding Micronesian migration to Hawai’i, the prevalence of serious medical conditions including diabetes in this population, the importance of secondary prevention including diabetic footwear in this population, and the aims and objectives of this practice inquiry project (PIP).

Background

During the colonial period Spain incorporated Micronesia as part of its Pacific Empire and in 1899, after the Spanish American War, Micronesia was purchased by Germany. As such, during both World Wars, Japanese military forces occupied Micronesia (Grieco, 2003). After the wars, per United Nations Mandate in 1947, much of Micronesia was held in trust by the United States as the “Trust Territory of the Pacific Islands” (Shek & Yamada, 2011, p. 1). Given the strategic advantages of these islands, the United States has promoted dependence rather than independence as clearly outlined in the 1963 Solomon Report (Hawai’i Appleseed Center for

Law and Economic Justice [Hawai'i Appleseed], 2011). For example, the importation of canned meat, white rice, flour and sugar encouraged the transition from subsistence farming to a sedentary lifestyle. As agricultural lands became unusable due to nuclear fallout and destruction by military operations, the traditional subsistence fishing and agricultural economy was replaced by one of economic dependence (Hawai'i Appleseed, 2011).

Compacts of Free Association

In discussing the movement of Micronesians to the United States, it is important to distinguish immigration from migration. In the 1980s the Trust Territory of the Pacific Islands was divided into the Commonwealth of the Northern Marianas Islands and the Freely Associated States with separate treaties termed Compacts of Free Association (COFA) (Shek & Yamada, 2011). These compacts allow free entry of Micronesians into the United States as nonimmigrants, the right to employment without a visa or health screening, and the ability to stay indefinitely, but no right to vote. Although initially COFA citizens received Medicaid, the Personal Responsibility and Work Opportunity Reconciliation Act in 1996 excluded them from the category of "qualified immigrants" and thus many federal programs including Medicaid and supplemental nutrition assistance (Shek & Yamada, 2011). The observation that "the movement of people from the former colonies from the periphery toward the center is a time-honored historical phenomenon" (Shek & Yamada, 2011, p. 4) would more accurately describe the migration of people from Micronesia to Hawai'i and other states.

Micronesian Migrants in Hawai'i

The State of Hawai'i is one of the most culturally diverse and geographically isolated places on earth. The newest and fastest growing group is Micronesian which per the United States Census includes Guamanian or Chamorro, Mariana Islander, Saipanese, Palauan,

Carolinian, Kosraen, Pohnpeian, Chuukese, Yapese, Marshallese, I-Kirbati and “other Micronesian” (Hixson, Hepler & Kim, 2012, p. 14). Employment and health needs are the major reasons for migration to Hawai’i (Pacifica Web Organization, 2014). The great majority of Micronesian migrants work in the service industries in minimum wage jobs. Over 50% of Chuukese families and approximately 75% of unrelated Chuukese individuals residing in Hawai’i have incomes below the poverty level (Pacifica Web Organization, 2014). Most migrants have little education, have never achieved steady employment, and speak little or no English (Yamada & Probutsky, 2009).

Micronesian Migrants and Diabetes

Micronesians suffer from maladies of both developing and developed regions due to the remote location yet strong influence from the United States. While there are high rates of Hansen’s disease and tuberculosis (more commonly associated with developing countries), the leading causes of morbidity and mortality are those frequent in developed nations such as cardiovascular disease, diabetes mellitus, chronic obstructive pulmonary disease, and cerebrovascular disease (McNaughton & Jones, 2013). Common to developed nations, Micronesia suffers from high rates of type 2 diabetes and cardiovascular disease as well as metabolic syndrome (Probutsky, Krupitsky & Yamada, 2009).

The prevalence of diabetes mellitus is high in the Micronesian migrant population. For example, in the Marshall Islands an estimated 50 percent of the population over the age of 35 has diabetes (Naseem, 2010). Unfortunately, the end-stage consequences of diabetes, including neuropathy, blindness and renal failure, are also significantly elevated (Probutsky, Krupitsky & Yamada, 2009). In Chuuk State, diabetes is the leading cause of death (Ichiko, Shomour, Marar, Lippwe & Aitaoto, 2013). These figures frankly illustrate the gravity of the situation.

Statement of the Problem

The Micronesian migrant population residing in Hawai'i has significantly higher rates of hospitalization at younger ages than all other populations in Hawai'i. Regarding endocrine disorders (including diabetes), one study showed that Micronesians were hospitalized at an age 7 years younger than Native Hawai'ians, 13 years younger than whites, and 24 years younger than Japanese participants (Hagiwara, Miyamura, Yamada & Sentell, 2015). One study of Marshallese and Chuukese migrants in Hawai'i County found 94% to be below the federal poverty line with obesity rates of 81% in Chuukese and 43% in Marshallese with this study group taking an average of 4.4 medications, most of which were for chronic conditions including diabetes (Tan, Haumea, Juarez & Grimm, 2014).

In the Micronesian population traditionally, as is common in tropical climates, footwear is minimal or nonexistent leaving feet exposed to injury. This is especially significant in diabetes where peripheral neuropathy decreases sensation so that initial injuries are not detected as they cause no pain. In diabetics, healing is often delayed due to vascular compromise decreasing the supply of oxygen and nutrients. In one study in the Marshall Islands, the most common diabetic complication on hospital admission was foot gangrene with many requiring amputation (Karki, Bhandary, Korean & Braind, 2003). The problem is that traditional diabetic footwear is often not worn as it is expensive and bulky. When addressing the needs of this population whose very migration is often precipitated by the need to seek healthcare for serious medical conditions including diabetes, an alternative, safer option to traditional footwear is needed to prevent pressure-related injury ultimately resulting in gangrene requiring amputation.

Aims and Objectives

The overarching goal of this PIP was to address one aspect of secondary prevention in the Micronesian migrant population residing in East Hawai'i, preventative foot care in the diabetic. The accepted practice of protective footwear which is bulky and expensive is impractical in this population with limited financial resources living in a tropical climate. The purpose of this project was to work transculturally to assimilate protective accommodations into traditional footwear to produce attractive, safer and affordable options for secondary prevention of pressure-related foot injuries in diabetics in this population.

Aim #1: Assess characteristics of diabetic footwear usage in Micronesians living in East Hawai'i.

- Objective #1: Distribute a customized survey to collect baseline data about diabetic footwear use among Micronesians in East Hawai'i.
- Objective #2: Analyze survey results to identify patterns and preferences for footwear.
- Objective #3: Analyze survey results to identify barriers and facilitators to diabetic footwear use.

Aim #2: Develop a culturally-based and affordable, safer alternative to commonly worn footwear.

- Objective #1: Investigate best-practices for diabetic footwear.
- Objective #2: Explore low-cost options for diabetic footwear.
- Objective #3: In collaboration with a podiatrist and a cultural advisor, create 3 to 5 prototypes for culturally-based modifications to traditional footwear which provide safer, culturally appropriate, and affordable options.

Aim #3: Pilot the prototype footwear options.

Objective #1: Recruit a sample of 5-10 healthy participants to trial wearing the prototype shoes for one week.

Objective #2: Survey the participants for feedback about the shoes.

Objective #3: Propose changes based upon evaluation results.

This transcultural PIP focused on secondary prevention as regards diabetic Micronesian migrants living in East Hawai'i. After assessment of current footwear usage, cultural and personal preferences, as well as barriers and facilitators, a pilot program of modification of preferred footwear was performed. This novel approach embraced a transcultural team collaboration of participant and healthcare provider to promote an aesthetically pleasing and desirable alternative to what is currently available, bulky and expensive footwear versus traditional rubber slippers or bare feet. (Sandals which may be otherwise be referred to as flip-flops or thongs are locally known as rubber slippers and will be referred to as such in this project.)

CHAPTER TWO

Review of Literature

A review of literature was performed in order to understand the Micronesian diaspora and to delineate the current knowledge regarding social determinants of health, diabetes mellitus and its associated complications, quality healthcare objectives, and patient-centered care. Major search engines included ProQuest, CINAHL, MEDLINE, PubMed, and Google Scholar. Additional reference sites which contributed significant knowledge utilized include the Institute for Healthcare Improvement, and the Official U.S. Government Site for Medicare. Specific knowledge was sought to delineate socioeconomic determinants of health specific to Micronesian migrants.

Background Information

South Pacific Islands, also known as Oceania, are divided into three cultural areas; Melanesia, Micronesia and Polynesia (see Figure 1). These terms are from the Greek words *nesos* for island, *melas* for black, *micro* for small, and *poly* for many. Micronesia was described as being made up of small islands, Polynesia as many islands, and Melanesia was believed to provide a description of the dark-skinned indigenous people. Oceania is the last area inhabited

by humans as well as the last area colonized and subsequently decolonized (Stanley, 2016).

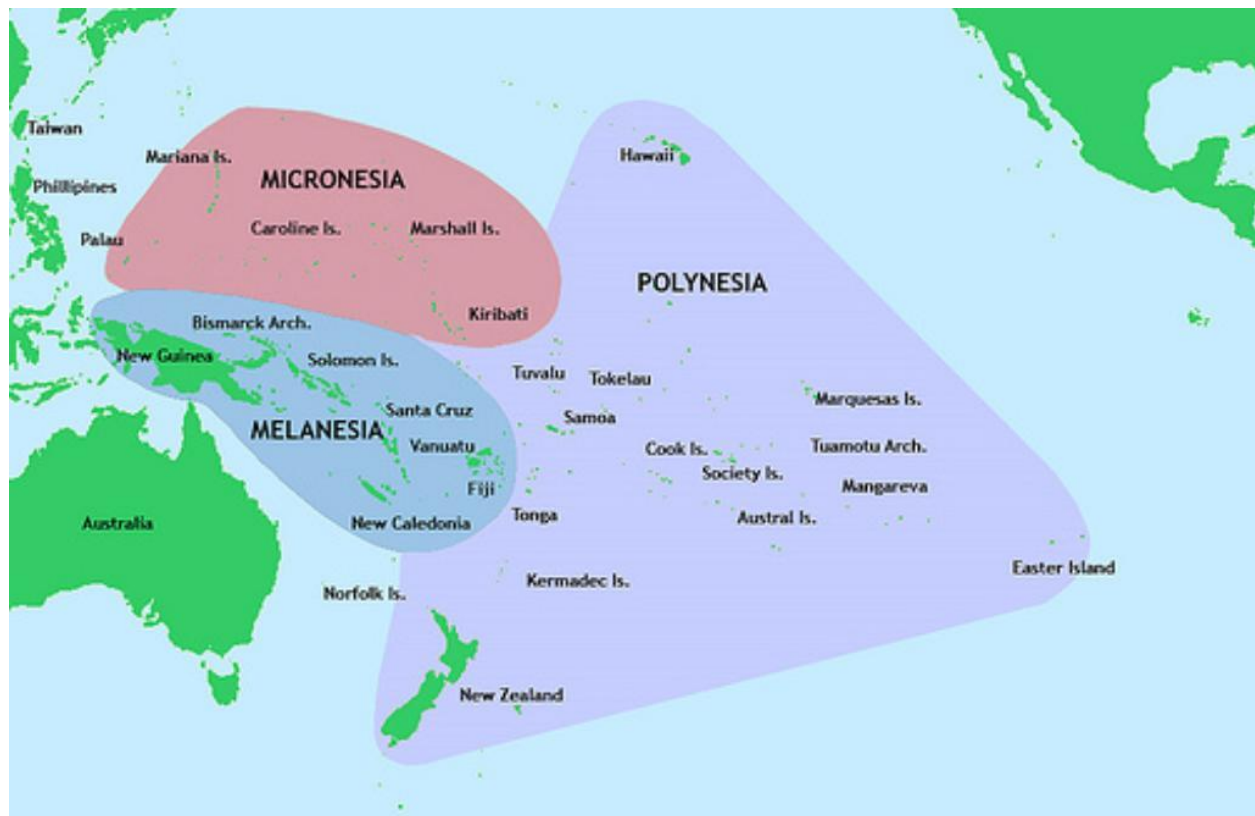


Figure 1. Pacific cultural areas. Reprinted from Micronesia, n.d., in *Wikipedia* Retrieved October 11, 2016, from https://upload.wikimedia.org/wikipedia/commons/9/93/Pacific_Culture_Areas.jpg

Micronesia encompasses approximately 2100 islands in four island chains; the Caroline Islands, the Gilbert Islands, the Mariana Islands, and the Marshall Islands. The Caroline Island chain incorporates the island of Palau as well as the Federated States of Micronesia (FSM). The 607 small islands of FSM are divided into four states: the seven separate island groups of Chuuk State; the island of Kosrae; the largest island, Pohnpei; and the 144 islands and atolls of Yap (Kondratas, n.d.; FSM Visitors Board, 2012).

History

Oceania was populated by two distinct migrations from Southeast Asia with the first 40,000 years ago of Papuans who settled Near Oceania and the second migration 35,000 years ago of Austronesian language migrants who subsequently spread to Remote Oceania (Kondratas, n.d.). The first European contact was through Spanish sailors including Magellan who landed in Guam in 1521, Saavedra who landed in the Marshall Islands in 1527, and Villalobos who landed in the Caroline Islands in 1543 (Stanley, 2016) with Micronesia subsequently becoming a part of the Spanish Pacific Empire. After the Spanish American War in 1899, Spain sold Micronesia to Germany; hence, during both World Wars the German ally Japan occupied this region (Grieco, 2003). After World War II, the Trust Territory of the Pacific Islands was formed with the trust held by the United States.

Nuclear Proving Grounds

The United States conducted nuclear testing (see Figure 2) from June 1946 to November 1962 in Micronesia in an area termed the Pacific Proving Grounds (Nuclear Weapons Archive, 2001). In 1954 a test entitled Castle Bravo became the largest thermonuclear device the United States would utilize to date while simultaneously earning the distinction of also being the worst radiological disaster associated with the United States to date. The force of the Castle Bravo blast was expected to be six megatons but proved to be 15 megatons.

The Castle Bravo test should have been postponed due to adverse weather conditions; however, as it was not, unfavorable winds intensified the area of radiation fallout. Nuclear fallout was particularly critical for the Rongelap Atoll where inhabitants had been totally unaware of the testing and “believing that this powder was snow, many inhabitants played in and ate the powder” (Rowberry, 2014).



Figure 2. Photograph of nuclear testing in Micronesia in 1946. Reprinted from The World's Biggest Bomb: Behind the Scenes Gallery. *Public Broadcasting System*. (2011). Retrieved October 11, 2016 from <http://www.pbs.org/wnet/secrets/the-worlds-biggest-bomb-image-gallery/859/#9>

A preponderance of the evidence substantiates the destruction of coral reefs from bombs during World War II, post-war nuclear testing, as well as ballistic missile testing in the Pacific Proving Grounds of Micronesia resulting in the extinction of 28 species of coral (Richards, Berger, Pinca & Wallace, 2008). Academic literature review documents the transformation from agricultural land supporting crops such as breadfruit, kava, taro, and a wide variety of tropical fruits to destruction of agriculture via salt water contamination. The rising sea levels accompanying climate change further compound the damage to the natural environment caused by World War II and nuclear testing (Haws, 2006).

Compacts of Free Association

The literature review of documents relating to COFA between the United States and the FSM demonstrates acknowledgement of harm done via nuclear and ballistic testing as well as failure to fulfill the original goals of the relationship between the United States and FSM. The original goals were trifold: (1) Strategic advantage for the United States; (2) to promote democracy in Micronesia; and (3) to promote self-sufficiency of a democratic Micronesia. This strategic advantage allows the United States “the right to deny potential adversaries access to the territory, airspace and territorial waters” of FSM (Fairlamb, 2002). The promotion of democracy has been successful with the establishment of a democratic constitution designating three levels of government; federal, state, and local, with each state having a democratic constitution (Constitution of the Federal States of Micronesia, Article VII). It is the third goal of self-sufficiency which has not been met. FSM university student, Leonard Leon reports “The self-sustaining part of COFA is a total failure, so a lot of us are left struggling” (University of Hawai’i at Manoa [UHM] Ethnic Studies, 2013).

The review of the literature pertaining to migration reveals documentation that FSM citizens may enter the US, secure employment, and establish permanent residence as a nonimmigrant (Fairlamb, 2002). FSM citizens are entitled to use of the medical facilities of the Department of Defense and the National Health Service Corps (Public Law 108-188, 117 STAT 2740). The federal government will reimburse “affected jurisdictions as a result of increased demands placed on health, educational, social, or public safety services or infrastructure” (Public Law 108-188, 117 STAT 3739, section 3). In 2010, the state of Hawai’i received \$11.2 million in federal funding as reimbursement for healthcare costs for FSM migrants (Hawai’i Appleseed, 2011).

Diaspora

Primary considerations fueling the diaspora from Micronesia include the lack of access to clean water, healthy food, and medical care. The literature review confirms rising sea levels and increasing storm patterns in Micronesia further contaminating water sources with saline bleaching of agricultural land (Haws, 2006). Overfishing via dynamite and chlorine products has resulted in unsustainable harvesting. As population growth increases and land area decreases, human and animal contamination via solid waste continues to “impact both biodiversity and public health” (Haws, 2006, p. 101). While those holding a bachelor degree account for only 5% of migrants, that rate is higher than those remaining in Micronesia, indicating the diaspora includes the complication of “brain drain” (Hezel & Levin, 2012).

Health Disparities

Health disparities or inequities may be defined as “differences in the presence of disease, health outcomes, or access to health care between population groups” (Boston Public Health Commission, n.d.). Such inequities are social issues which are avoidable. In the pursuit of health equity, the characteristics of disparities must be clearly delineated in order to be overcome.

Social Determinants of Health

There are many factors affecting the health of a population to include both the social and physical environments. The physical environment includes basic needs such as climate, clean air and water; however, also includes influences such as green spaces, housing, and community access to roads, sidewalks, safe lighting, bike lanes, walking paths, schools and other public buildings. Social environment determinants include access to resources to meet daily needs,

crime, racism, language and culture, education, economic opportunities, access to healthcare and technology (U.S. Department of Health and Human Services, 2016).

Daily needs. There is a strong association between health and wealth which is well documented in the literature (Smith, 1999; Semyonov, Lewin-Epstein, & Maskileyson, 2013). Access to healthy food, clean water, clean air, and sanitary living conditions varies according to financial resources. Low socioeconomic status is associated with poor health and increased morbidity and mortality (Link & Phelan, 1995). The individual risk factors associated with poor health such as poor diet and lack of physical exercise are clearly documented and understood with access to these daily needs directly dependent upon socioeconomic status. Air and water pollution, overcrowding, and lack of access to supermarkets are associated with poorer neighborhoods (Schulz, Krieger & Galea, 2002). Lower socioeconomic status thus may prohibit individuals from accessing clean air, clean water, healthy food, and adequate housing.

Opportunity for education and employment. Education is positively correlated with improved health, with decreased mortality and morbidity. Education results in broader employment opportunities with healthier work environments and greater income. Education also enhances thinking skills and ultimately the capacity to understand and therefore comply with the complexities of healthcare issues (Lleras-Muney, 2004). There is a clear correlation between education with employment opportunities and subsequently improved health outcomes and greater longevity (Marmot & Smith, 1991).

Socioeconomic conditions. Socioeconomic status is strongly associated with health as well as directly associated with access to resources and other social capital. Access to resources and social capital is known to reduce stress and to provide health benefits (Schulz, Krieger & Galea, 2002). Low socioeconomic status is associated with housing being limited to areas where

crime is more prevalent reducing recreational opportunities and increasing stress levels. Empiric research indicates there are deleterious effects of continuing stress upon health as the nervous system is unable to return to homeostasis. The brain responds to stress as danger triggering the autonomic nervous system to respond in what is often referred to as a fight-or-flight response. While this response is appropriate in a dangerous situation, the stressors common to the modern era such as job stress and traffic jams produce continual stimulation such that a return to homeostasis is not achieved. McEwan (2008) has termed long-term accumulation of stress *allostatic overload* which is directly associated with detrimental lifestyle changes including overeating and drinking in an unconscious effort to reduce these effects. McEwen's model is chosen to define allostasis (see Appendix A, Figure 1), and the deleterious effects on health from specific stressors related to this vulnerable population (see Appendix A, Figure 2).

Language. Culture and language have strong influences on health outcomes as dissemination of information from healthcare providers to individuals and communities may be misunderstood or unintelligible. Language and culture are distinct entities and understanding a language may not indicate an understanding of the cultural context in which the information will be received. Language and cultural competency may not ensure health literacy. In order for healthcare communication to be effective, language, culture, and health literacy must be clearly delineated and barriers broken down (Schyve, 2007).

Transportation. Transportation barriers are associated with delay in seeking healthcare, missed appointments, and delay with obtaining medication ultimately resulting in poorer health outcomes. Factors affecting transportation include access to vehicles or to public transportation. Low socioeconomic status is associated with greater transportation barriers including access, financial cost, and length of commute (Syed, Gerber & Sharp, 2013). Transportation barriers

resulting in delay of seeking healthcare until emergency department treatment via ambulance transport is required often resulting in increased stress as transportation home following treatment may not be accessible.

Social Determinants of Health of Micronesian Migrants

Micronesians suffer from maladies of both developing and developed regions due to the remote location yet strong influence from the United States. While there is a high rate of Hansen's disease and tuberculosis, the leading causes of morbidity and mortality are currently cardiovascular disease, diabetes mellitus, chronic obstructive pulmonary disease, and cerebrovascular disease (MacNaughton & Jones, 2013). The risks associated with nuclear testing and radiation exposure are significant and vary according to exposure and type of cancer (Land, Bouville, Apostoaei, & Simon, 2010). The largest risks per geographical exposure are to the Rongelap Atoll with lesser risks to the most-southern areas. Thyroid cancer risks in particular have strong correlation with radiation exposure to as high as a 95% lifetime risk (Land et al., 2010). The full consequences for the Micronesian population as a result of nuclear testing are unknown, especially those pertaining to the descendants of those exposed as nuclear testing in the Pacific region by France occurred as recently as 1996.

The social determinants of health related to the Micronesian diaspora are well documented in the literature. Transitioning from small villages to the United States obliterates social capital with its accompanying correlation to health (Eriksson, 2010; McDonald & Mair, 2010). Empiric research illustrates the effects of stress upon health as the body responds to continuing stressors and subsequently is no longer able to return to baseline or allostasis (McEwen, 2008). McEwen's model illustrates both the body's response to stress (see Appendix A, Figure 1) and the deleterious effects on health from continuing stress or allostatic overload

(see Appendix A, Figure 2). Geographical relocation to Hawai'i with the accompanying loss of social support compounding physical illness, language barriers, employment difficulties, adjusting to a modern metropolitan lifestyle in the face of racism and discrimination create allostatic overload for many Micronesian migrants.

Daily needs. The great majority of the Micronesian population in Hawai'i works in service industries in minimum wage jobs. Over 50% of Chuukese families and approximately 75% of unrelated Chuukese individuals residing in Hawai'i have incomes below the poverty level (Pacifica Web, 2014). The cost of living in Hawai'i is high; however, the minimum wage in 2016 is \$8.50/hour. According to the United States Department of Agriculture (USDA, 2014) Supplemental Nutrition Assistance Program (SNAP) eligibility criteria, a family of four with two adults employed full time at minimum wage residing in an apartment in Honolulu would qualify for approximately \$800 monthly supplemental assistance. Unlike legal immigrants who hold green cards, migrants from the COFA regions including Palau, FSM, and the Marshall Islands are not qualified aliens and therefore not eligible for SNAP benefits unless proven to be victims of human trafficking (USDA, 2011). As the great majority of food is shipped to Hawai'i, supermarket costs are approximately 66% higher than in the 48 contiguous states (Uyeno, n.d.) leading to the difficult choice of purchasing quality fresh produce versus more affordable, calorie-dense, lower nutritional value items to simply afford enough to eat. In the rural areas in which most COFA citizens in Hawai'i County inhabit, the nearest supermarket is many miles away leaving only smaller markets within walking distance. Smaller markets are associated with increased prices, limited choices, and decreased availability of fresh fruits and vegetables (Powell et al., 2006) further increasing the likelihood of continuing the unhealthy legacy of the

need to consume canned meat, refined carbohydrates, and a diet associated with the development of obesity, diabetes, and metabolic syndrome.

Opportunity for education and employment. Most COFA migrants have little education, have never achieved steady employment, speak little or no English and come seeking employment, education and health care, often coming from a village with thatched huts (Muralidharan, 2014). For students to graduate from high school in Hawai'i, they must be proficient in English (which takes approximately five to seven years) in order to take regular classes. No matter what subject matter is covered, courses labeled English Language Learner do not accrue educational credits for graduation. For this reason, COFA students are often "pushed out" of the education system at the age of 18. Chronic absenteeism associated with transportation and communication difficulties as well as the COFA student's strong family cultural commitments compound the difficulties of learning the English language skills as well as the subject content (Matsuda, 2016).

Likewise, institutions of higher learning post significant barriers to access for Micronesian migrants. According to the University of Hawai'i (2013) at Manoa and at Hilo, resident tuition rates are not applicable to COFA migrants. COFA students must pay 150% of the resident tuition in order to attend the University of Hawai'i which is a state-supported institution. The State of Hawai'i utilizes an excise tax on all services conducted in the state. Although legal residents and taxpayers of the State of Hawai'i, COFA migrants are not eligible for resident tuition. This distinction unjustly targets a vulnerable population to assume a greater portion of contribution to an educational institution funded by excise tax dollars.

Obtaining employment in Hawai'i is especially problematic for Micronesians given negative stereotypes, discrimination, limited education, language barriers, and social/cultural

assimilation difficulties. A Chuukese migrant for over 20 years currently working for Goodwill Hawai'i in a job training program reports, "These people are coming from an underdeveloped area with limited resources, into this big city of Honolulu. A lot of them don't even know what to wear. I have to train people to get used to wearing pants" (Keany, 2011). In congregate, these factors contribute to difficulty finding employment and limit employment to entry-level positions at minimum wage.

Socioeconomic conditions. The federal poverty level in 2016 is \$11,880 for individuals (Department of Health and Human Services, 2016). In Hawai'i, one survey of COFA citizens showed an annual per capita income of \$10,500 with a household income of \$42,150. As is common to many migrants and immigrants, the custom of remittance is a part of the Micronesian culture with many sending funds for air travel to family intending to migrate, thus further reducing usable income. Most COFA migrants live in rental units with only 4% owning their own homes (Hezel & Levin, 2012). In Hawai'i County, most live in rural areas with no walkable access to supermarkets, department stores, libraries, or hospitals.

Language. Micronesia includes thousands of islands with many different dialects within the Austronesian language group. Languages include Marshallese, Chuukese, Kosraean and Nauruan among many others (Kondratas, n.d.). Micronesian culture emphasizes oral traditions and there was no written language; therefore, transferring knowledge was considered a restricted privilege requiring strict memorization and limited to individuals requiring the information (Palafox, Buenconsejo-Lum, Riklon, & Waitzfelder, 2002). The great variety of languages and the reliance upon oral tradition make translation difficult. Trained medical translators are particularly difficult to find, thus creating a language barrier to healthcare education.

Transportation. As Hawai'i is a remote island chain, gasoline prices are some of the highest in the United States. Many COFA migrants residing in Hawai'i County rely on public bus transportation at \$2.00 per one-way fare with many rural areas having services only three times daily (Hawai'i County Mass Transit Agency, 2016). This makes shopping at supermarkets and scheduling medical and other appointments costly, time consuming, and difficult.

Social Disparities Affecting Micronesian Migrants

Racism. Hawai'i contains the most culturally diverse population in the United States. The relatively recent addition of significant numbers of Micronesians migrants differs from previous migrations and immigrations in that Hawai'i is currently struggling with issues of overcrowding and economic difficulties. It is ironic that at the same time cultural diversity, cultural competence, and cultural respect are being integrated as fundamental cornerstones of education in Hawai'i, Micronesians migrants are not commonly afforded any of the fruits expected of such an education. Micronesian migrants were discriminated against by the State of Hawai'i in July 2010 when dropped from the state healthcare program known as Med-QUEST (Yamada, 2011). Micronesian youth suffer taunts from other students such as "microscope" or "Microsoft" as well as discrimination from educators who fail to understand the complexities of simultaneously learning English as well as course work (Okomato et al., 2008). There is an abundance of derogatory Micronesian jokes which in itself is appalling at this point in the evolution of such a culturally diverse modern society. For example, one joke broadcasted over a radio station prompted an on-line petition "to end derogatory racist jokes and comments about the people of Micronesia" (Caron, 2014).

In the documentary produced by the Japanese American Citizens League (2013), University of Hawai'i at Manoa (UHM) student Russell Thoulag expressed his frustration as a

fellow bus passenger derided Micronesians as “they have ugly gold teeth and wear these ugly clothes and they spit everywhere and get drunk.” Having historically experienced racism and discrimination, the Japanese American Citizens League is advocating for Micronesians as newer members of the community facing similar issues.

Micronesian traditional attire includes an intricately embroidered textile most commonly handcrafted into women’s skirts (Kihleng, 2015). In Hawai’i, these skirts are easily recognizable as distinctly Micronesian. Nla Aiaoto is a graduate student at UHM of Hawai’ian, Samoan and Yapese ancestry who was raised in Kosrae. Aiaoto has encountered racism in the community when she chooses to wear a Micronesian skirt to include shop keepers assuming she is purchasing with a government-issued SNAP card, and reports being treated differently by both doctors and nurses. According to Aitaoto, “When I use business wear, I look more Polynesian than Micronesian, but when I put the skirt on, it is just magic. It’s like I put a target on. People treat me differently. . . It’s very blatant” (Blair, 2011).

Language. Within the health care system, Micronesians are further discriminated against by lack of qualified medical interpreters resulting in poor understanding of medical instructions and conditions. Yamada (2011) reports, “Much non-adherence is because practitioners communicate ineffectively, often because interpreters are not utilized. For their part, some Micronesians harbor suspicions that they are being subjected to unnecessary procedures for the sake of physician profit or experimentation” (p. 58). Yamada (2011) also recorded the opinion of a medical student as “everybody is sick of caring for and wasting their taxes on these people that have no appreciation for what is being done for them, and fake their illnesses to stay in the hospital for free food and board” (p. 58). Thus, denial of health care for financial reasons is justified by labeling this population as undeserving of care.

Culture. The cultures of COFA migrants vary significantly; however, all are quite different from modern American culture. The American concept of time is much different than on a small island with limited electricity. As shared by one Micronesian migrant in Hawai'i, Josefa Munez, "In our country, it's so easygoing. We don't look at the clock. You walk the way you want to walk, slowly" (Keany, 2011).

Micronesian migrants often delay obtaining healthcare and are often reluctant to challenge or to question authority. Instead, for Micronesians the culturally appropriate, respectful response is to simply ignore the instructions deemed inappropriate or incomprehensible and avoid any further contact with the healthcare authority figure (Salem Health, n.d.). Likewise, when dealing with authority figures such as healthcare workers, direct eye contact is considered disrespectful.

Socioeconomic conditions. FSM migrants residing in Hawai'i received medical care under a state program for low-income adults and families known as Med-QUEST which provided benefits equal to federal Medicaid. In 2009, in light of the economic downfall, legislation was enacted to replace Med-QUEST coverage for COFA citizens with a more-limited program known as Basic Health Hawai'i (Hawai'i Appleseed, 2011). Basic Health Hawai'i limited hospitalization to 10 days per year, outpatient visits to 12 per year, and prescriptions to four per month (Hawai'i Appleseed, 2014). Medicare covers 60 days of hospitalization per year without copayment, has no limit of prescriptions per month and no limit for medically necessary outpatient visits (Official U.S. Government Site for Medicare, 2016).

When taking into consideration the complicated health conditions of migrating FSM citizens, for example patients on dialysis, Basic Health Hawai'i was at least inadequate and at most a death sentence. Basic Health Hawai'i was implemented in July 2010 and subsequently

challenged as discriminatory on the basis of national origin (Hawai'i Appleseed, 2014). In December 2010, a preliminary injunction restored medical benefits to COFA migrants (Brown, 2010). In April 2014, the Ninth Circuit Court determined Hawai'i is "not constitutionally obligated to provide state health insurance with the same level of benefits as the federally-funded Medicaid program" (Hawai'i Appleseed, 2014) as federal funding for noncitizens of the United States was terminated in the 1996 Welfare Reform Act (State of Hawai'i, 2014). Fortunately, on November 18, 2014, COFA citizens were declared eligible for medical coverage under the Affordable Care Act (Associated Press, 2014).

Health disparities.

Chronic diseases. While there are high rates of Hansen's disease and tuberculosis, the leading causes of morbidity and mortality for Micronesians are currently cardiovascular disease, diabetes mellitus, chronic obstructive pulmonary disease, and cerebrovascular disease (McNaughton & Jones, 2013). The prevalence of diabetes and its serious consequences is high in the Micronesian migrant population. In the Marshall Islands an estimated 50 percent of the population over the age of 35 has diabetes (Naseem, 2010). End-stage consequences of diabetes mellitus including blindness and renal failure are high in the Micronesian population (Probutsky, Krupitsky & Yamada, 2009). In Chuuk State, diabetes is the leading cause of death (Ichiko, Shomour, Marar, Lippwe & Aitaoto, 2013).

In one study in the Marshall Islands, the most common diabetic complication on hospital admission was foot gangrene with many requiring amputation (Karki, Bhandary, Korean & Braind, 2003). The Micronesian migrant population residing in Hawai'i has significantly higher rates of hospitalization at younger ages than all other populations in Hawai'i (Hagiwara, Miyamura, Yamada & Sentell, 2015). When addressing the needs of this population whose very

migration is often precipitated by the need to seek healthcare for serious medical conditions such as diabetes, secondary prevention is of utmost importance.

Access to care. COFA migrants are not eligible for Medicaid and are not eligible for Medicare unless they have satisfied the requirements for age and work history in the United States. Requirements for age are 65 years or older and having legal permanent residence in the United States for at least five years. Requirements for work history are 40 work units, most commonly accrued via employment in the U.S. for 10 years (Health Network Group, LLC, 2016). In the United States, diabetic footwear is predominantly funded by Medicaid and Medicare Part B with patients responsible for 20% of the Medicare-approved amount (Official U.S. Government Site for Medicare, 2015). According to the Hawai'i Department of Commerce and Consumer Affairs (2016), COFA migrants from FSM, the Marshall Islands and Palau are eligible for Med-QUEST with Med-QUEST-Net also providing options for a family at \$61.80 per month.

In addition to financial barriers accessing health care, many Micronesian migrants to Hawai'i County (commonly known as The Big Island) find it difficult to adjust to a large and diverse population leading to a feeling of insecurity regarding their place in this new home. "This unanticipated insecurity has driven them toward insularity within their own group" (Carucci, 2012, p. 205). This affords both challenges in gaining trust and partnership, appropriate transcultural healthcare translation, and opportunities to access healthcare.

Diabetes

The American Diabetes Association (ADA) (2004) defines diabetes as "a group of metabolic diseases characterized by hyperglycemia resulting from defects in insulin secretion, insulin action, or both." Type 1 diabetes is an immune-mediated destruction of beta cells in the

pancreas resulting in insulin insufficiency affecting 5-10% of cases. Type 2 diabetes results from insulin resistance affecting 90-95% of cases. Type 2 diabetes is strongly correlated with obesity, age, and sedentary lifestyle (ADA, 2004).

Pathophysiology

Diabetes type 2 is characterized by impaired insulin excretion and increased insulin resistance which significantly involves liver, skeletal and adipose tissues. Impaired insulin excretion of beta pancreatic cells is linked to secretory stress. The physiology of insulin secretion is complex involving glucose, various nutrients, and gastric hormones stimulating beta cells to produce the prohormone proinsulin which is subsequently split into insulin and C-peptide. Reduced insulin sensitivity is present in obesity, tobacco smokers, type 2 diabetics, and during time of increased levels of cortisone and growth hormone (Östenson, 2001). Thus, type 2 diabetes involves decreased production of insulin with increased resistance to insulin required for glucose to be transported from plasma to individual cells.

Effects of Diabetes

As transport of glucose to cells is mandatory for energy production, the effects of impaired transport can be seen in all body systems. These include macrovascular complications involving the heart, brain and legs, as well as microvascular complications involving the eyes, the renal system, neuropathies, and in particular the small vessels providing nutrients to the legs and feet (ADA, 2016).

Cardiovascular. Diabetes increases the risk of cardiovascular disease or stroke to at least double to quadruple that of the general population (American Heart Association, 2015). The risk factors are compounded by association with obesity, hypertension, sedentary lifestyle, hypertriglyceridemia, and abnormal cholesterol levels to include increased low-density

lipoproteins and decreased high-density lipoproteins. Diabetic cardiomyopathy may occur without the complicating risk factors noted above. Diabetic cardiomyopathy may result in structural changes including left ventricular hypertrophy and interstitial fibrosis, functional changes including both diastolic and systolic dysfunction, and metabolic changes including mitochondrial dysfunction (Boudina & Abel, 2010).

Renal. Approximately 20% to 30% of diabetics develop diabetic nephropathy. Excretion of albumin in urine is one hallmark of diabetic nephropathy. Complications may include renal hypertension, decreased glomerular filtration, and eventually end-stage renal disease. Hyperglycemia increases the risk of nephropathy as mesangial cell glucose concentrations are altered. Increased permeability results in proteinuria which may initiate an inflammatory response further accelerating fibrosis and nephropathy. The renin-angiotensin system is disrupted increasing glomerular capillary pressures stimulating fibrosis (Butt, Hall & Nurko, 2010).

Retinopathy. Approximately one third of diabetics experience diabetic retinopathy (DR) with one third of those cases being severe enough to be vision threatening (Lee, Wong & Sabanayagam, 2015). DR is the leading cause of blindness in adults ages 20-74 (Cheung, Mitchell & Wong, 2010). Hyperglycemia is associated with damage to retinal vasculature ultimately leading to hemorrhage and/or edema with approximately half of those with diabetic retinopathy also developing diabetic macular edema (National Eye Institute, 2015). The presence or absence of neovascularization allows categorization of DR into proliferative or non-proliferative (Fraser & D'Amico, 2014). Secondary prevention is extremely important in diabetics as DR is usually asymptomatic, the disease progresses quickly, and early treatment is effective (Fraser & D'Amico, 2014).

Neuropathy. Approximately 30% of diabetics currently have diabetic neuropathy (DN), although it is anticipated that 50% of diabetics will develop DN during their lifetime (Callaghan, Cheng, Stables, Smith, & Feldman, 2012). DN most often presents with distal symmetric polyneuropathy (DSP). The symptoms associated with DSP are “numbness, tingling, pain, and/or weakness that begin in the feet and spread proximally in a length-dependent fashion (stocking and glove distribution)” (Callaghan, Cheng, Stables, Smith, & Feldman, 2012). Sensation is more affected than motor function with decreased sensation leading to unrecognized pressure injury or other foot trauma until the injury becomes quite significant.

Hyperglycemia and dyslipidemia are both factors which increase the likelihood of developing DN and DSP. Diabetic vascular compromise accompanying DN leads to alteration in weight bearing, altered anatomy, and decreased skin integrity so that approximately 80% of foot ulcers occur in diabetics (McCulloch, 2015). Diabetic foot ulcer complications are responsible for two-thirds of non-traumatic foot amputations in the United States (Armstrong, de Asla & McCulloch, 2016).

Diabetic neuropathy often leads to loss of intrinsic motor function resulting in toe deformities which increase the risk for pressure injury (National Diabetes Education Program, 2000). Footwear which is poorly fitting increases the risk for pressure-related injury. Customized footwear accommodations are required in cases where deformities are present. The purpose of diabetic footwear is to provide protection from foot injuries which may not be detectable in diabetics as the sensory pain response is diminished related to diabetic neuropathy.

Six Domains of Healthcare Quality

Following the Institute of Medicine (IOM) 1999 publication *To Err is Human: Building a Safer Health System*, in 2001 the IOM provided a more-detailed report including aims for

improvement entitled *Across the Chasm: Six Aims for Changing the Health Care System*. In this publication, the authors described a broad gap between ideal health care and the current status. Examination of each of these domains is vital to assure each category is taken into consideration in an effort to produce optimum health outcomes.

Safety

Given the complexity of the modern healthcare system in a multicultural society, ensuring safety requires considerable attention to details. While practitioners have long considered the concept of “first do no harm,” this is now not enough to ensure patient safety. Nosocomial infections, medication errors, and other medical errors were reported as the eighth leading cause of death in the United States (IHI, 2016). This sobering statistic makes the consideration of safety of any proposed project a high priority.

Effectiveness

As evidence-based practice changes on a continuum, the effectiveness of treatment should also be tracked and practice changes initiated to incorporate new knowledge. Effectiveness takes into consideration both the overuse and underuse of treatment. Should practice rely on tradition rather than evidence, patients may be offered ineffective treatment and simultaneously be denied access to effective treatment. Optimal patient care requires access to current evidence-based practice information and relies on collaborative efforts to implement appropriate practice changes (IHI, 2016).

Patient-centered

The 2001 IOM report indicated a paradigm shift had occurred in the delivery of healthcare. As practitioners were expected to see more patients in less time, the needs of the healthcare system became more important than the needs of the patient. In shifting back to

patient-centered care consideration of “patients’ cultural traditions, their personal preferences and values, their family situations, and their lifestyles” (IHI, 2016) is required. In order to achieve quality outcomes, the patient must be the autonomous decision maker and the healthcare system must be responsive and accommodating.

Timely

Waiting periods delay access to healthcare. In the current healthcare system patients wait for appointments, answers to questions, delivery of test results, and for transfer of care. Waiting also places an additional emotional burden on patients. The ideal situation would include same-day appointments, timely answers to questions, quick access to test results, and an efficient referral process allowing for quick transfer to obtain specialty care when necessary (IHI, 2016).

Efficient

In addition to wasted time as noted above, the healthcare system wastes money and materials. Inefficiencies often result in duplication of effort, further wasting resources. Some estimates show healthcare providers are efficient only 50% of the time with the other 50% spent doing unnecessary paperwork. Healthcare professionals often invest much time simply accessing information from other departments (IHI, 2016).

Equitable

In order for a healthcare system to be ideal it must be accessible to all members of the population. Socioeconomic disparities abound in the United States with much data showing poorer health outcomes in populations with lower socioeconomic status. To achieve equity in healthcare, there must be a single standard for all patients (IHI, 2016).

Patient-Centered Care

Health care includes sick care as well as wellness care or prevention in order to achieve maximum health benefits. Each person is unique; therefore health care is complicated. Each person is influenced by culture, socioeconomic situations and a myriad of other factors which must be taken into consideration in order to meet individual needs. The science of medicine is studied using populations to produce recommendations for evidence-based care while the art of medicine is carried out via tailoring to meet the needs of each individual via patient-centered care (Epstein & Street, 2011). In tailoring a patient-centered care model for Micronesian diabetic migrants living in Hawai'i County, specifically concerning secondary prevention as regards pressure injuries to feet, careful consideration must be given to assure care is affordable, culturally appropriate, climate appropriate, aesthetically pleasant, and protective.

Affordable

In order to meet the needs of patients, healthcare must be affordable. The financial burdens are disproportionate with those patients of lower socioeconomic status who are less able to accommodate co-pays, transportation costs, and other factors such as missed time from employment in order to pursue healthcare. The average cost of health insurance per person is approximately \$15,500 per year. This is usually split between employer and employee with the portion paid by employee not differentiated by wage. Employees across all wage groups of one employer pay the same amount for health care which obviously impacts those making minimum wage more significantly than those earning more (Minarik, 2014).

Culturally appropriate

Compassionate healthcare in modern multicultural settings demands an understanding of the people and culture in order to understand and respect the viewpoints of the population.

Communication across cultures and socioeconomic status is difficult and requires effort. In order to achieve culturally appropriate healthcare, the practitioner and patient must work as a team with the patient valued as an individual who may see the world from a much different perspective than the practitioner. The lack of culturally appropriate care is well documented to result in poor patient outcomes as well as health disparities (Papadopoulos, Shea, Taylor, Pezella & Foley, 2016).

Climate appropriate

When considering diabetic protective footwear, climate must be factored in. One study done in the Philippines demonstrated that 91% of diabetics wore inappropriate footwear with comfort being the determining factor in choice with 53% wearing no shoes while indoors and only 6.5% of males and 1.61% of females taking foot safety into consideration (Isip, de Guzman, Ebison Jr. & Narvacan-Montano, 2016). Another study in India demonstrated diabetics avoiding the use of socks or shoes in hot weather in an attempt to lessen the symptoms of neuropathy (Hartalkar, Hartalkar, Peshwe, & Nath, 2016).

Aesthetically pleasing

As found in the Philippine study noted above, the great majority of diabetics consider comfort as the determining factor in footwear choice (Isip, de Guzman, Ebison Jr. & Narvacan-Montano, 2016). Even when expensive diabetic footwear is provided at no cost, one study found only 22% of patients actually wore these shoes on a regular basis (Knowles & Boulton, 1996). The lack of adherence may be associated with the perception of the footwear being unattractive or the perception that there is no danger to diabetic feet in the perceived safety of one's home (Boulton & Jude, 2004). In patient-centered care, consideration of what is aesthetically

appealing to individual patients must be taken into consideration as this may prove to be a critical factor for appropriate use of diabetic footwear.

Protective

The ultimate aim of diabetic footwear is to prevent injury. While the risks of ill-fitting shoes are well documented, one study of diabetic patients with a history of pressure ulcer found that expensive custom footwear versus the control group with customary footwear showed no significant reduction in the risk of re-ulceration (Reiber et. al, 2002). In warm climates such as Hawai'i, bulky footwear is generally undesirable and occlusive footwear should also be avoided in patients prone to tinea pedis which proliferates in warm dark places (Goldstein & Goldstein, 2015). A patient-centered model of care of diabetic feet supports the use of affordable, culturally appropriate footwear, modified as necessary to improve fit and to avoid overheating, discomfort, areas of skin breakdown and pressure ulcers in the diabetic population residing in Hawai'i.

Revised Health Promotion Model

This PIP was a seven-day pilot program utilizing the Revised Health Promotion Model (HPM) developed by Pender (see Appendix B). This framework is ideal to address achievement of a higher level of secondary prevention in this diabetic population. The HPM encompasses a patient-centered approach and anticipates motivating factors to promote a better health outcome. Patient autonomy assesses individual behavior and then incorporates a change model which is tailored to individual preferences. The HPM is applicable in all stages of life and health and therefore specifically applicable in secondary prevention. The HPM may be tailored to meet one particular goal and was therefore appropriate for this project.

Model Design

Organization of the revised health promotion model is as follows: 1) prior related behavior including personal factors; 2) perceived benefits and barriers; 3) commitment to action; 4) immediate competing demands and preferences; and, 5) health promoting behavior (Pender, 1996).

Design Tailored to this Project. As regards prior related behavior including personal factors, this assessment included determination of the like or dislike of traditional diabetic footwear. Current footwear ownership and preferences was quantitatively and qualitatively determined by using an initial survey questionnaire. This questionnaire included patterns of cultural footwear preferences including that of not wearing any footwear while indoors, specifically while at home.

Perceived benefits and barriers. The comorbidities and complexities of diabetes make full comprehension of the benefits and consequences of secondary prevention difficult (McElfish, 2015). Socioeconomic disparities, an external locus of control coupled with a low perception of self-efficacy, provide additional significant barriers (McElfish, 2015). The perceived benefit of diabetic control as a whole in this particular population is hindered by the complexity of the disease and its ramifications (McElfish, 2015). The perceived benefit is yet to be determined as there is no literature available regarding modification of existing footwear within a cultural context as opposed to either wearing approved diabetic footwear or not.

Commitment to action. The goal of this project was to encourage a commitment to action by role models within the population. Assessment of diabetics within the Marshallese community has indicated “There’s that one first example. Because . . . we don’t like to listen and then we do it. We want to see it. We want to see action. We want to see a real result and then

we're gonna do it" (McElfish, 2015, p. 49). This pilot program was formulated in an effort to stimulate role models to initiate culturally appropriate and attractive modifications to existing footwear in order to provide a safer and affordable alternative.

Immediate competing demands and preferences. In the management of a complex chronic health condition such as diabetes, there are many competing demands for attention. The goal of this project is to incorporate traditional cultural crafts such as embroidery in a new endeavor of protective footwear. Preferences regarding modifications are entirely personal. The incorporation of enjoyable crafts with personal preference has been demonstrated by this project to be advantageous and attractive.

Health promoting behavior. The aim of this project was to encourage health promoting behavior within culturally appropriate preferences. This includes consideration of socioeconomic disparities including language barriers, financial restrictions, competing demands, and perception of risks and benefits.

CHAPTER THREE

Project Design and Evaluation Plan

The overarching goal of this project was to enhance secondary prevention in diabetic Micronesian migrants to Hawai'i County via the development of an alternative, safer option to traditional footwear in order to prevent pressure-related injury. In this endeavor a pilot study was designed to explore options to alter commonly worn footwear to provide a safer alternative. The purpose was to evaluate the effectiveness of evidence-based and culturally congruent alterations in footwear as measured by willingness to increase the length of time more-protective footwear is actually worn by Micronesian migrants. Qualitative assessment and evaluation were included to gain insight and to provide further recommendations.

Project Design

The study design for this project was a pilot study. The design was intended to assess the feasibility of altering commonly worn footwear in diabetic Micronesian migrants in East Hawai'i in order to increase the usage of more protective footwear and to decrease the incidence of pressure injury. The pilot study design was chosen in order to provide the "requisite initial step in exploring a novel intervention or an innovative application of an intervention" (Leon, Davis & Kraemer, 2011, p. 626). In this project, a pilot study was intended as a brief test of feasibility in a small number of participants (Hulley, Cummings & Browner, 2013). The framework includes the planning stage, trial of the project, analysis of outcome, and recommendations for further projects (see Appendix C).

Setting

The setting for this project was the County of Hawai'i (also locally known as the Big Island) with a total land area of 4,024.42 square miles and an estimated 2015 population of

196,428 people (Department of Research & Development Hawai'i County [DRDHC], 2016).

The project was conducted in Hawai'i County which includes the Districts of Puna, South Hilo, North Hilo, and Hamakua. This setting was outpatient, rural and agricultural. The climate is tropical with the average annual rainfall 127 inches and average temperatures annually ranging from 66.4 to 81.2 degrees Fahrenheit (DRDHC, 2016).

Participants

Study participants were recruited from the Micronesian migrant population residing in the Districts of Kona, Puna, South Hilo, North Hilo, and Hamakua. Outcomes were targeted towards adult Micronesian migrants with diabetes mellitus; however, survey distribution was not specific to any disease state. Inclusion criteria were adults age 18 and over and consent to participate in the project. Exclusion criteria for prototype testing were designed for safety and included diabetes mellitus, peripheral vascular disease, previous or existing lower extremity pressure injuries, limb prosthesis, lower extremity dressings, rheumatoid arthritis, inability to ambulate independently, and cerebrovascular disease with residual weakness.

Methodology

Aim #1: Assess Characteristics of Diabetic Footwear Usage in Micronesians Living in East Hawai'i. In order to promote secondary prevention of pressure-related foot injuries, an assessment was first made to determine footwear preferences and utilization in the study population.

Objective #1: Distribute customized survey to collect baseline data about diabetic footwear use among Micronesians in East Hawai'i. A preliminary survey was constructed by the PIP director which consisted of 11 multiple-choice questions. These included demographic data, history of diabetes, as well as footwear preference and current ownership. This customized

paper survey (see Appendix D) included images of different types of footwear in order to clarify specific types, such as rubber slides, rubber slippers, and walking sandals. Chain-referral sampling was utilized in an exponential, non-discriminative approach where recruited participants provided multiple referrals. This non-probability sampling method is of particular benefit in accessing samples in groups which are difficult to find. In this method, “The first subject recruited to the sample group provides multiple referrals. Each new referral is explored until primary data from sufficient amount of samples are collected” (Dudovskiy, 2016). Informed consent was completed prior to the survey (see Appendix E). Survey participants were compensated with \$5.00 gift certificates. Surveys included no names, birth dates, addresses, or other personal identifying data. The only health data surveyed was the presence of diabetes, prediabetes, or unspecified risk for diabetes. Surveys were numbered consecutively for data analysis. Original paper surveys were stored in a locked cabinet, aggregate data on a password protected computer.

Objective #2: Analyze survey results to identify patterns and preferences for footwear.

Initial survey questionnaires were analyzed to quantify footwear preferences as well as which types were currently owned. Survey questionnaire responses were manually entered onto a Microsoft Excel Spreadsheet for analysis. The data were then presented in graph format. The data were further analyzed to identify trends associated with age and gender, and again presented in graph format.

Objective #3: Analyze survey results to identify barriers and facilitators to diabetic footwear use. Initial survey questionnaires were also analyzed to quantify footwear barriers and facilitators including cost, comfort, convenience, esthetics, and origin. Survey questionnaire

responses were again manually entered into the Microsoft Excel Spreadsheet for analysis. The data were analyzed to determine themes associated with age and gender.

Aim #2: Develop a Culturally-based, Affordable, Harm-reducing Alternative to Footwear Used by Micronesians with Diabetes. According to the Joslin Diabetes Center (2016), diabetics should never go barefoot which is the cultural norm for tropical climates, particularly when indoors. As most Micronesian migrants have limited expendable income, cost is a primary concern when choosing articles of clothing. As many Micronesian migrants have no healthcare, the cost of standard diabetic footwear is prohibitive. In Hilo, the neighborhood drug store advertised prefabricated diabetic shoes for \$155.55 plus \$90 for inserts (Shiigi Drug Company, Inc., 2016). In order to enhance foot protection in the population, a low-cost alternative to bare feet or ill-fitting affordable sandals is a safer option.

Objective #1: Investigate best-practices for diabetic footwear. Guidelines for diabetic footwear were identified using electronic search databases of peer-reviewed journals and publications from professional organizations such as the American Orthopaedic Foot and Ankle Society. These guidelines were analyzed to identify and summarize priority characteristics of effective protective footwear.

Objective #2: Explore low-cost options for diabetic footwear. Investigation was performed regarding different shoe types, alteration strategies, and materials needed for shoe modification. Soles were obtained from low-cost rubber slippers purchased locally. Alterations involved replacement or covering the plastic straps. Strategies also included ensuring generous allowance between the entire foot and the edge of the sole utilizing a bigger size than participants reported commonly worn in closed shoes. Cotton and velour fabrics were purchased by the yard at low cost.

Objective #3: In collaboration with a podiatrist and a cultural advisor, create 3 to 5 prototypes for culturally-based modifications to traditional footwear which provide safer, culturally appropriate, and affordable options. Prototypes were developed based upon recommendations from a cultural advisor in order to ensure esthetic appropriateness and prevent development of culturally offensive designs. Designs common to Micronesian skirt patterns to include embroidered flowers were explored. Podiatry consult was obtained once prototype designs were developed to provide feedback regarding footwear appropriateness and safety. Prototypes incorporated best practices for diabetic footwear.

Aim #3: Pilot the prototype footwear options. For this project, five prototypes were developed for shoes. As rubber slippers and slides are the most commonly worn footwear choices, these were included in footwear options. In addition, a ballet-type flat shoe was discussed in an effort to explore the feasibility of a non-sandal option. Participants were individually measured to assure accommodations were appropriate in both size and shape. Prototypes were tailored to these healthy participant's specific needs.

Objective #1: Recruit a sample of 5-10 healthy participants to trial wearing the prototype shoes for one week. A sample of 5-10 healthy Micronesian migrants was recruited to wear the prototype shoes for a one-week trial period after providing informed consent and contact information for follow-up. Exclusion criteria for prototype testing included diabetes mellitus, peripheral vascular disease, previous or existing lower extremity pressure injuries, limb prosthesis, lower extremity dressings, rheumatoid arthritis, inability to ambulate independently, and cerebrovascular disease with residual weakness. A one-week trial allowed participants to evaluate the comfort and practicality of the footwear and to complete a post-trial survey.

Participants received \$20 gift cards for participating and the option to keep the prototypes if desired.

Objective #2: Survey the participants for feedback about the shoes. Prototype participants were asked to complete surveys post prototype trial (see Appendix F) after the one-week trial of footwear prototypes and providing informed consent (see Appendix G). This seven-question survey was also developed by the PIP director as an assessment tool to ascertain participant experience wearing the prototype footwear for one week. A Likert scale portion was utilized to quantify esthetics and desire to continue to wear the footwear. The final question was qualitative, “Do you have any comments about participating in this study?” This open-ended approach was intended to allow participants to describe their experiences with the project as a whole.

Objective #3: Propose changes based upon evaluation results. Once the evaluative surveys were analyzed, recommendations were made related to additional modifications addressing cost, culturally appropriateness, and diabetic footwear in tropical climates.

Protection of Human Subjects

Survey data were kept on a password protected computer. No identifying data were included in surveys. Participant risks included discomfort, difficulty walking, and pressure injury. The risks of the new shoes was potentially greater harm than the old shoes. These were risks that are already inherent to walking and to wearing new footwear of any type. Participants were advised that if any discomfort or difficulty walking should occur to immediately discontinue wearing the footwear and contact the researcher. Participants were also advised to follow up with their primary care provider if they experienced any foot injury. The PIP director completed Collaborative Institutional Training for Protection of Human Subjects as per

University of Hawai'i (UH) requirements. The project was submitted to the UH Institutional Review Board and approval was granted on February 23, 2017 (see Appendix H).

Resources

This study required funds for a maximum of 50 initial survey participants receiving \$5.00 gift cards and a maximum of 10 prototype participants receiving \$20.00 gift cards. In addition, allocation was made for footwear supplies and a cultural/language consultant for a total budget of \$1275.00 (see Appendix I). Podiatry consult was obtained at no cost. The preliminary survey took five days, beginning February 23, 2017. Prototype development and distribution to participants took one week, beginning March 1, 2017. The one-week trial of the prototype footwear began March 8, 2017 (see Appendix J).

Conclusion

The object of this PIP was to explore the development of footwear options for diabetic Micronesian migrants to the County of Hawai'i which are culturally appropriate, affordable, and safer than traditional and commonly utilized footwear. It was anticipated this transcultural nursing pilot project would provide novel approaches and insight into the needs and wishes of this population in a collaborative effort to promote secondary prevention of pressure-related diabetic foot injuries.

CHAPTER FOUR

Project Implementation

The overarching project goal was to address one aspect of secondary prevention in the Micronesian migrant population residing in East Hawai'i, preventative foot care in the diabetic. This goal was derived from the problem statement identifying socioeconomic disparities in this population with high rates of diabetic neuropathy leading to serious foot injury. This goal was achieved via the project aims and objectives. The results of these aims and objectives are detailed in this chapter.

Framework Guidance

The project was based on the Revised Health Promotion Model developed by Pender which provided the guiding framework for this project. The fundamental concept in this patient-centered model is that individuals' characteristics and experiences influence motivating factors to promote better health outcomes. As such, actions were collaborative partnering to promote better health outcome in this transcultural endeavor.

Data Analysis

Aim #1: Assess characteristics of diabetic footwear usage in Micronesians living in Hawai'i County

Objective #1: Distribute customized survey to collect baseline data about diabetic footwear use among Micronesians in Hawai'i County. Executive board members of the advocacy organization Micronesians United on the Big Island (MU-BI) were consulted and voted to endorse this project. Preliminary surveys were distributed via chain sampling in partnership with MU-BI. A total of 42 surveys were collected and participants presented with \$5 gift cards in appreciation of this participation. Participants included 32 females (76 percent) and

10 males (24 percent) with 18 participants (42 percent) age 18-34, 16 participants (38 percent) age 35-49, and 10 participants (23 percent) age 50-64.

Objective #2: Analyze survey results to identify patterns and preferences for footwear. Of the 42 participants surveyed, 52 percent preferred rubber slippers alone with 64 percent preferring rubber slippers along with other types and 19 percent preferring rubber slides (see Figure 3). Only 11 percent chose tennis shoes which would afford the greatest protection from foot injury given the closed nature of the footwear. In marked contrast is the remaining 89 percent of participants surveyed with little or no accommodation afforded for protection of the feet from pressure areas or outside injury related to exposure of the foot.

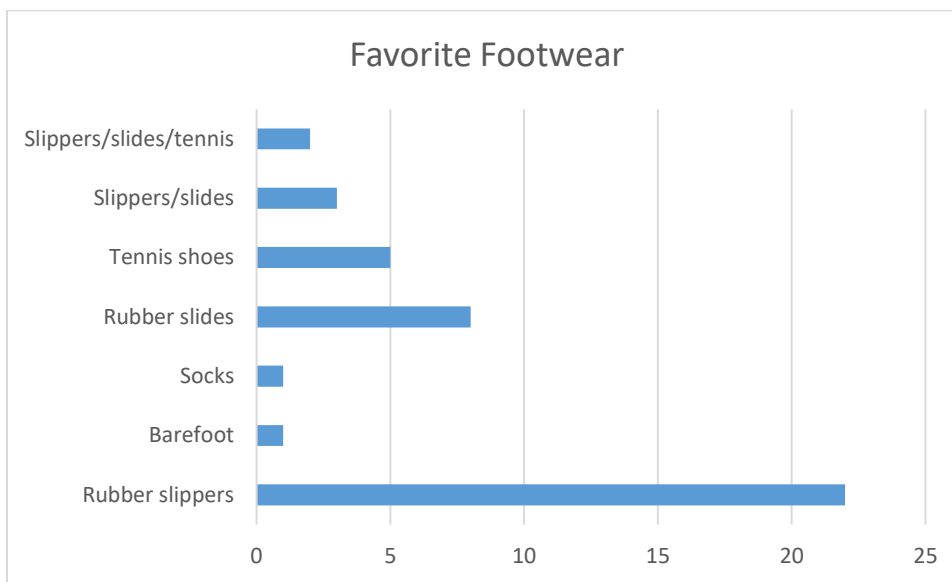


Figure 3. Preliminary survey results of favorite footwear.

Ownership patterns revealed that of the 42 participants surveyed, 78 percent owned rubber slippers, 59 percent owned tennis shoes, 40 percent owned rubber slides, and 38 percent owned walking sandals (see Figure 4). Given the high percentage of participants owning and preferring rubber slippers, the preliminary survey demonstrated an opportunity to improve health outcomes should rubber slippers be able to be made safer as regards pressure-related injury.

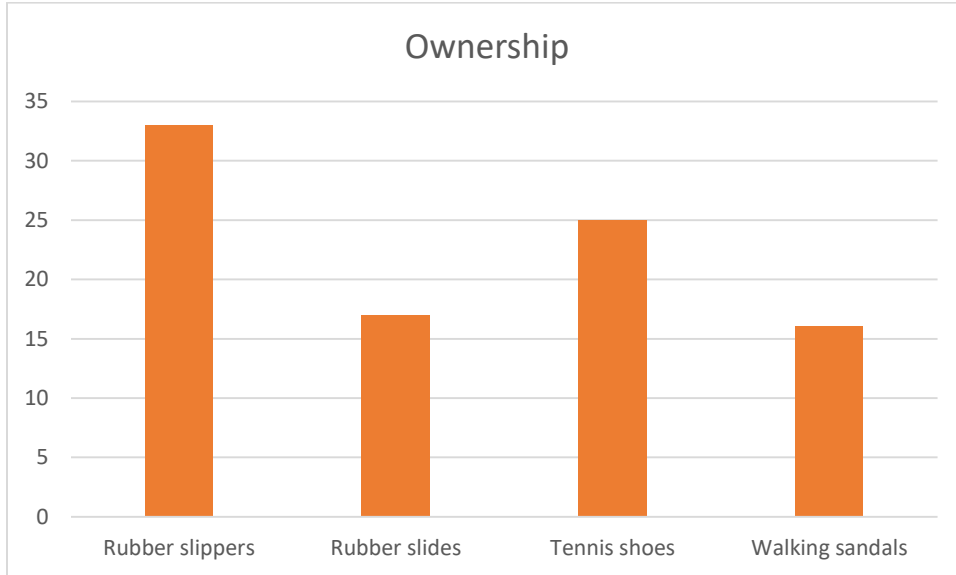


Figure 4. Preliminary survey results of ownership of footwear.

Objective #3: Analyze survey results to identify barriers and facilitators to diabetic footwear use. Participants were queried as to their preferences and the ultimate deciding factors when choosing footwear. Of the 42 participants surveyed, comfort and cost were the primary considerations in footwear choices with 47 percent ranking comfort number one and 40 percent ranking cost number one (see Figure 5). Ranking number two findings demonstrated continuation of this trend as 40 percent choose comfort with cost and sandal style each

accounting for 21 percent.

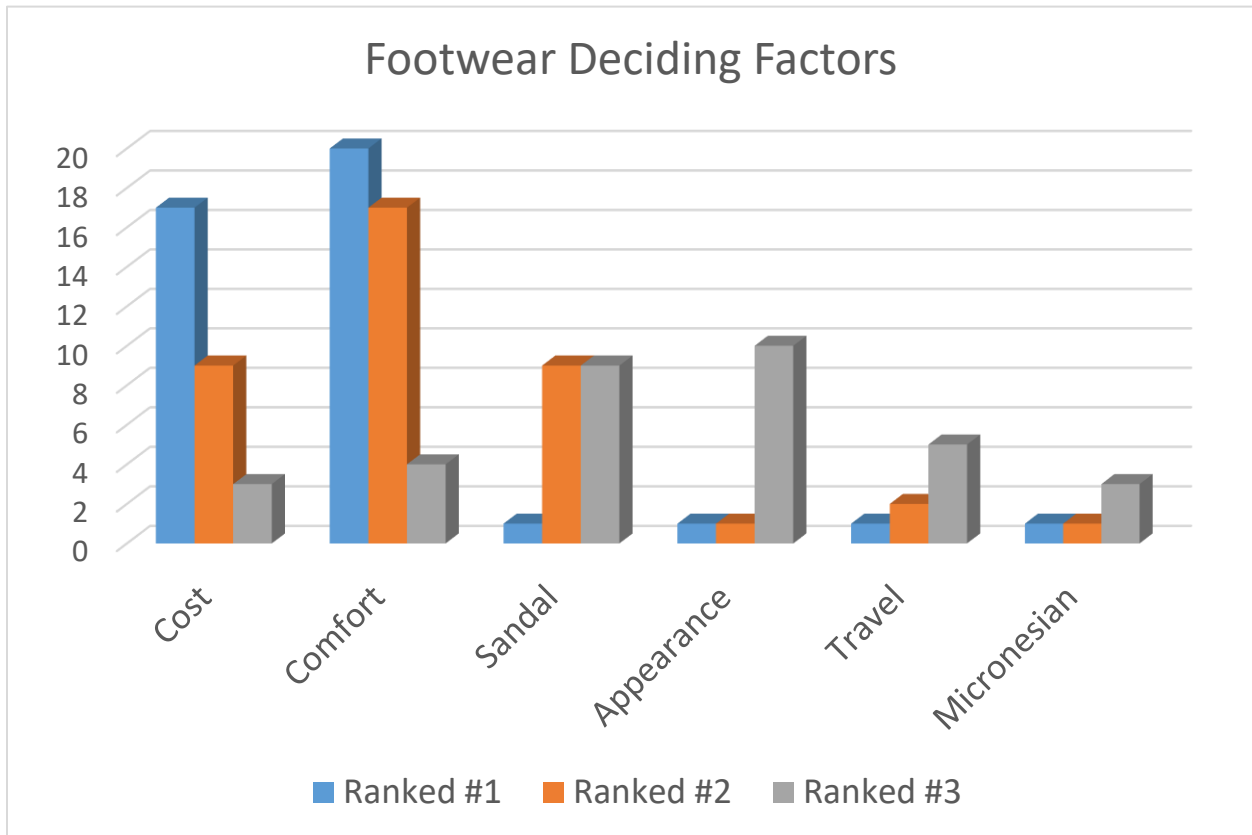


Figure 5. Deciding factors in footwear choices.

Aim #2: Develop a culturally-based and affordable, safer alternative to commonly worn footwear

Objective #1: Investigate best-practices for diabetic footwear. Diabetic footwear should be constructed of a soft material that is not rigid. A thick shoe sole is optimal as this will allow cushioning. Laced shoes are preferred as they provide better support. Fitting is important to allow space between the toes and the front of the shoe (Joslin Diabetes Center, 2016). The key points in diabetic footwear are to prevent areas of pressure, to absorb shock, and to prevent inflammation by accommodating deformities and stabilizing the foot (American Orthopaedic Foot and Ankle Society, 2016).

Expert podiatric advisement was obtained. In addition to the considerations noted above, the podiatrist advised to also carefully assess placement of the heel in order to provide 1/4 to 1/2 inch allowance when considering an open-back type of footwear. The podiatrist reported observing the common practice of wearing rubber slippers with the foot aligned at the edge of or even overhanging the back and sides of the rubber slipper sole which exposed the heel area to injury. The same assessment should be provided for the front of the foot to assure footwear fitting provided positioning of the foot with 1/4 to 1/2 inch allowance to provide some protection from rubbing against objects. The podiatrist advised consideration of sole thickness as well as pursuing options for soles with heel depressions included in order to promote central placement of the heel in the rubber slipper.

Objective #2: Explore low-cost options for diabetic footwear. The first option considered was alteration of the traditional rubber slipper in order to provide protective cushioning between the foot and the toe divider and overlying strap. This could be performed by inserting padding around the toe divider and strap and then covering with a soft material. It could also be performed by entirely replacing the toe divider and overlying strap with rolled padding covered with a soft material which would afford customization to allow sufficient clearance between the foot and the strap to minimize pressure. Both of these methods allow for the provision of cushioning and therefore protection from the hard plastic which may cause pressure from the toe divider and/or the overlying plastic strap caused by direct contact with the dorsal aspect of the foot.

A second option considered was to alter a slide-type sandal to provide cushioning between the foot and the overlying fabric. Replacement of the overlying fabric with a soft and/or padded fabric also provides the opportunity for customization to allow for greater clearance to

prevent rubbing or constriction. Insertion of Velcro could be utilized to allow adjustment of clearance should edema occur. This would afford protection should foot size change during the day.

A third option considered was to construct a ballet-type shoe with soft sides. Construction would allow incorporation of insole material to cushion the plantar aspect of the foot and a thicker sole to allow cushioning. Shoe designer Cheri Paxton (2016) has developed a pattern and tutorial for construction of such a shoe at a cost of \$15 for a downloadable file. This provides a low-cost option to make many different shoes in different sizes. After purchase of this package, Paxton (2016) notes, “you have my full permission to MAKE (sic) and sell your own FINISHED (sic) items from these patterns.” As the patterns are printable, this would allow variations in sizes which could then be utilized for more than one person. This shoe is completely sewn on a home sewing machine with the sole attached utilizing the type of contact cement found in hardware stores. Sole options provided include heat-moldable to provide a custom fit to each wearer with the process done in an ordinary kitchen oven at 275 degrees Fahrenheit (Paxton, 2016).

Objective #3: In collaboration with a podiatrist and a cultural advisor, create 3 to 5 prototypes for culturally-based modifications to traditional footwear which provide safer, culturally appropriate, and affordable options. Study results were discussed in detail with the Micronesian cultural interpreter. It was decided to eliminate ballet-type flats and rubber slides from prototype considerations and to concentrate on modification of the rubber slipper. Preliminary prototypes were developed as follows: (1) A yoga-sling with the plastic strap removed and replaced by two crossing soft fabric straps (see Figure 6); (2) replacement of the plastic strap with a braided, soft, fabric strap brought up between the toes and going around the

back of the foot, anchoring through the existing side holes from the rubber strap (see Figure 7); (3) replacement of the plastic strap with fabric knotted over the foot and brought down through existing side holes; and (4) padding of the plastic strap around the toe divider and along the entire length of the strap (see Figure 8).

These four preliminary prototypes were then presented to the cultural advisor for discussion of cultural considerations. The yoga-sling and braided strap (see Figures 6-7) were rejected as being too complicated and inconvenient. The fabric replacement of the rubber strap was also rejected. Comments from the cultural consultant included, “I don’t feel safe in these, I don’t feel I can walk on the beach in these,” and “These will not work because I cannot run in them if I have to.”



Figures 6-7: Yoga slide and braided strap preliminary prototypes modeled by PIP director.

Discussion then ensued regarding the prototype with padding around the existing rubber strap. These were deemed to be culturally appropriate if modified. Suggestions for modification

included choosing colorful slipper bases, utilizing brightly colored fabric, and adorning with embroidery, foam flowers, shells, and beading. The cultural advisor noted that different island clans wore specific colors and as such a variety of colorful soles would make the rubber slippers more appealing to a greater number of people. It was also suggested that island identification in the form of a label be accommodated as this would provide substantial incentive to wear footwear which is distinctly associated with Micronesia (see Figure 8).



Figure 8: Final prototype for males with island label displayed.

In collaboration with the cultural advisor, a maximum budget of \$10 per pair of slippers was deemed appropriate. This was further discussed with members of the MU-BI board who were in agreement with this as a reasonable maximum budget for the average Micronesian migrant in Hawai'i County. Prototypes utilizing padding of commercially locally available rubber slippers were then developed. As per podiatry recommendations, care was taken to purchase those with soles of at least 1/2 inch. Fit was customized to each prototype testing participant to allow 1/4 to 1/2 inch of allowance surrounding the foot as per podiatry recommendation. Local retail prices of rubber slippers with preformed heel depressions proved

cost prohibitive at approximately \$30. Final retail prices of prototype rubber slippers ranged from \$3.00 to \$5.00 per pair prior to modification.

Modifications included 1/4-inch foam padding cut to shape around the toe divider as well as along the entire rubber strap. For males, strips of a black velour cotton fabric were utilized to wrap over the foam padding, tacking the ends on the outside of the slipper in order to avoid any seam lines with potential to provide pressure on the foot (see Figure 8). For females, brightly colored strips of cotton fabric were utilized in a similar manner. Small shells or foam flowers were glued to the top of the shoe and beading sewed along the top of the strap (see Figure 9). Quilting printable fabric was utilized to make island labels which were affixed to the lateral sole with glue and protected by overlying epoxy suitable for fabric and rubber (see Figure 8). The final prototypes were examined by the MU-BI board members and were deemed culturally appropriate, appealing and affordable, while noting the padding and covering provided a cushioning effect making the final product safer than the rubber slipper prior to modification.



Figure 9: Final prototype for females with foam flowers and adornment.

Aim #3: Pilot the prototype footwear options

Objective #1: Recruit a sample of 5-10 healthy participants to trial wearing the prototype shoes for one week. Participants for prototype testing were recruited via chain sampling from MU-BI board members. Inclusion criteria were adults age 18 and over and consent to participate in the project. Exclusion criteria for prototype testing included diabetes mellitus, peripheral vascular disease, previous or existing lower extremity pressure injuries, limb prosthesis, lower extremity dressings, rheumatoid arthritis, inability to ambulate independently, and cerebrovascular disease with residual weakness. A total of 10 participants were recruited to include three males (30 percent) and seven females (70 percent).

These 10 participants were provided prototype footwear for a one-week trial period after which time a second survey was performed to determine whether the participants liked the

footwear as well as how often and for what time periods the footwear was worn. A final open-ended question regarding comments and suggestions concluded the second survey.

Objective #2: Survey the participants for feedback about the shoes. Participants were queried as to whether they liked the prototypes and whether they found them to be comfortable. Of the 10 participants of the prototype trial, 100 percent responded they liked the shoes, found them comfortable, and wished to keep them (see Figure 10).

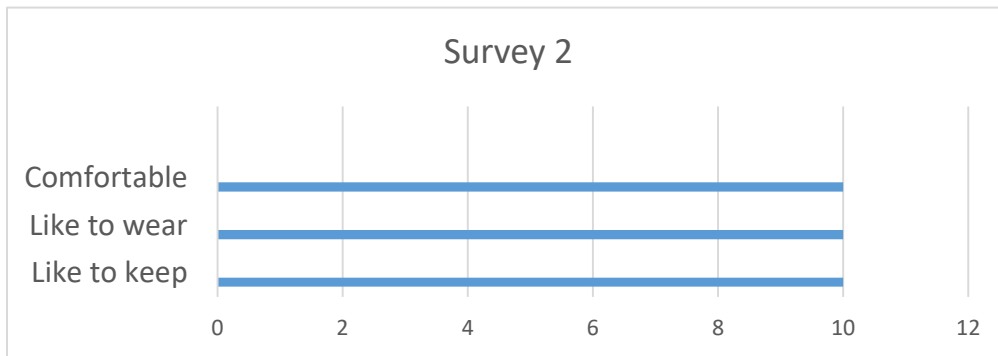


Figure 10: Prototype evaluation

The times worn varied with 70 percent reporting daily use, 20 percent every other day, and 10 percent reporting wearing the shoes two days (see Figure 11) with comments including, “I don’t use it workdays at work, but I wear it on the weekends.”

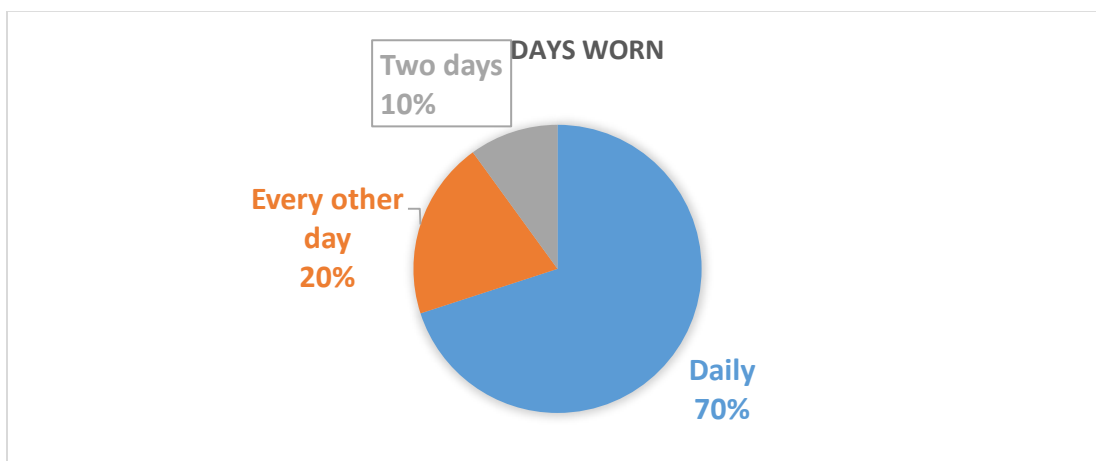


Figure 11: Days prototypes worn in one-week trial period.

The number of hours the prototypes shoes were worn each time varied with 30 percent reporting wearing the shoes all day, 20 percent half a day, 20 percent two hours, and 30 percent an hour or less (see Figure 12). Comments included “I am wearing them around the house when I get home from work.”

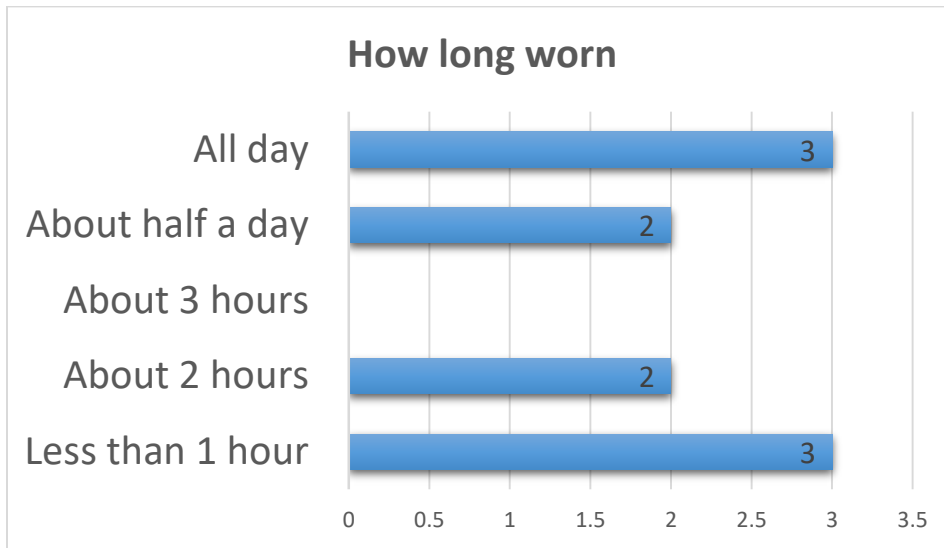


Figure 12: Average length of time prototype shoes worn.

Qualitative responses were positive (see Figure 13) including various suggestions for improvement of the prototype in the future.

Survey #	Comment
1	I would like to see some way to remove the covering so it could be washed. Other than that, I thought it was wonderful. Maybe your next one you could make it with a back cover like a strap to cover the heel so they don't slide off.
2	I am wearing them around the house when I get home from work. I think my comment is I think it is a good thing for people to help people wearing shoes safely. I think they are very comfortable. They are better than regular slippers. I think that for the Micronesian community there is going to be a use for people to learn how to make it, especially. For folks in the community, it could be a business for somebody and could be a community relief for people who are needing something like this.
3	I really like the padding because I was always getting blisters from the rubber slippers. I was hoping there was going to be more, maybe stepping up the

	process. I wish there were some other places, I wish I could get to see more of it. I love the fact that we could actually wash the cloth and insert changeable if you want. We can always put on our own or just take it off and use it the way we like.
4	I'll think about it. Well to me, it's pretty comfortable. I would wear them.
5	I'm using it. It's really good, nice and soft, very attractive. I don't use it workdays at work but I wear it on the weekends. I think you have to make sure the decorations do not go down where you have the toe. It was perfect for me but if it was for some folks with sickness it might cause a blister.
6	Maybe it should have a foam around the design or covered by plastic so it's more durable under weather conditions.
7	The cloth looks like it can come off, but good for inside the house.
8	Nice and beautiful but should be waterproof.
9	It's comfortable & nice but I can't wear it outside in the rain.
10	No comment.

Figure 13: Qualitative response to survey 2.

Several comments highlighted an overall positive reception of the project and excitement about the prototype. One participant noted, "I was hoping there was going to be more, maybe stepping up the process. I wish there were some other places, I wish I could get to see more of it." Another participant opined, "For folks in the community, it could be a business for somebody and could be a community relief for people who are needing something like this."

Objective #3: Propose changes based upon evaluation results. Prototype-testing participants offered change ideas including the possibility of making the cloth coverings waterproof. This could be accomplished with a protective spray of the type utilized for suede or other porous materials. Another proposed the fabric coverings be removable for washing. This could be accomplished with the final tacking of the fabric being altered from stitching to either

snaps or Velcro. Although initially rejected by the cultural advisor, one prototype participant requested change to include “a back cover like a strap to cover the heel so they don’t slide off.” This could be accomplished with a matching or complimentary fabric with either elastic or other method of providing stretch attached to the existing strap either as permanently sewn or detachable via snap or Velcro.

Compliance with Ethical Requirements

Executive board members of the advocacy organization MU-BI were consulted regarding possible cultural and language interpreters. MU-BI board members voted to endorse this project and to provide cultural and language assistance as needed. Survey and study participants were contacted via chain sampling with board members providing language interpretation as appropriate. A cultural advisor and a Chuukese interpreter were employed. MU-BI board members provided cultural and language interpretation to their chain sample participants. Informed consents were provided and explained in detail via board member translation as requested. All survey participant data were kept anonymous and secured on a password protected computer accessible only by the PIP director.

CHAPTER 5

Conclusions and Recommendations

The overarching goal of this PIP was to address one aspect of secondary prevention in the Micronesian migrant population residing in Hawai'i County, preventative foot care in the diabetic. In this transcultural nursing endeavor, Pender's Revised Health Promotion Model (1996) was utilized as it provides an emic perspective to promoting health. The emic perspective is an insider viewpoint as opposed to the etic or outsider perspective (Peters, 2017) which in this case would be from the viewpoint of a Micronesian migrant as opposed to that of a healthcare practitioner. While healthcare practitioners recognize the importance of lifestyle choices in secondary prevention, collaboration with patients across differences in culture, gender, age and socioeconomic disparities is complicated. Once a partnership to achieve a common goal of health promotion is formed, factors such as locus of control, perceived barriers, as well as interpersonal and situational influences are able to be examined in order to facilitate a commitment to action (Pender, 1996). This relationship between practitioner and patient acknowledges the expertise of the patient in determining individualized optimal health goals.

The preliminary survey data revealed the importance of comfort with 88 percent of survey participants reporting comfort to be of primary or secondary importance in footwear choices. Survey participants reported sandal style as the third significant factor in shoe choice with 24 percent ranking this of primary or secondary importance. The preference for comfort as a determining diabetic shoe choice was congruent with findings from studies examining footwear choices in tropical climates (Isip, de Guzman, Ebison Jr. & Narvacan-Montano, 2016) and cited previously. The findings of the project's survey indicated 70 percent of participants wore the prototype shoes daily which is a significant improvement from the prior study noted where

expensive diabetic footwear were worn by only 22 percent of participants regularly, even when the shoes were provided free of cost (Knowles & Boulton, 1996).

The preliminary survey data also revealed the importance of cost in footwear choices. The cultural advisor determined that a rational budget for a pair of shoes in this population is limited to \$10.00. These data clearly illustrate cost to be a significant barrier to diabetic footwear use given the locally available cost of \$150 plus \$90 per insert totaling \$330. Those individuals in this population who do have Medicare insurance coverage would still be responsible for the 20 percent out-of-pocket copayment which would be \$66. This out-of-pocket expenditure also provides a barrier to diabetic footwear use. Should inexpensive and comfortable options be available, these could facilitate the use of diabetic footwear in the Micronesian migrant population residing in Hawai'i County.

Cultural adaptations were suggested by the cultural advisor. These specifically included utilizing shoe soles and fabrics of vibrant colors, and adornment with shells, foam flowers, embroidery, beading and rhinestones, as well as island identification tags, in order to provide an affordable, aesthetically pleasing, and safer alternative than previously available. The cultural advisor opined that island identification tags would provide incentive for Micronesian migrants to own unique items not otherwise available. As the tags were produced via printing onto fabric, choices were not limited to nation identification and could be customized to any island or small atoll.

The project confirmed that comfort and aesthetics are significant determining factors in footwear choices. Factoring in the importance of cost, the rational decision-making process for COFA citizens in the County of Hawai'i was able to be understood from an emic perspective. When footwear is recommended by a healthcare practitioner, these considerations must be

understood and addressed in order to increase the amount of time footwear safer than the traditional rubber slipper is worn. This secondary prevention is provided to decrease the likelihood of pressure-related foot injury.

Facilitators and Barriers

This PIP director's position as a nonvoting member of MU-BI facilitated project implementation. MU-BI board members provided introductions to Micronesian migrants to facilitate chain sampling. MU-BI board members also provided language interpretation and the emic cultural perspective necessary for project implementation. Barriers included language translation across a myriad of dialects and limited time for project completion. These barriers resulted in a smaller number of preliminary survey participants reached as well as reduced options for footwear modification. Likewise, the limited time for the project prevented acquisition of fabric and/or adornments such as cloth flowers directly from Micronesian manufacturers. Future projects may benefit from collaboration with Micronesian manufacturers and artists. Future projects may also benefit from purchasing shoe soles with heel depressions from less-expensive sources than were locally available at the time of this project.

Strengths

Partnership with the Micronesian community sparked an out-of-the-box thinking perspective to address the problem of pressure-related foot injury in a population with a high prevalence of diabetes. This collaboration provided participants the opportunity to actively develop safer alternatives which are esthetically pleasing from an emic perspective. Over the course of this project, transcultural relationships evolved from interactions where the Micronesian mores of polite listening to healthcare recommendations were replaced by polite suggestions for improvement, and ultimately to critical assessment of prototypes and enthusiastic

recommendations for future modifications (see Appendix K). One participant noted, “I was hoping there was going to be more, maybe stepping up the process.” Another participant reported, “I really like the padding because I was always getting blisters from the rubber slippers.” These comments reflect overall project success as safer footwear changed from something that *should* be worn to something that was *desired* to be worn. The collaboration and constructive criticism provided by project participants should be acknowledged as the overarching strength of this project.

At the conclusion of this project, prototype participants requested and were provided instruction in construction of the final prototype tested expressing their intention to continue to provide modifications to traditional rubber slippers in order to make them safer as regards pressure injuries. The cultural advisor also further expressed interest in pursuing a provisional patent in order to proceed with marketing of the modified footwear. The development of a cottage industry to increase incomes would promote financial independence of Micronesian migrants. This would provide an alternative to agriculture or other traditional jobs both in Micronesia and for the Micronesian migrants.

Project Limitations and Weaknesses

The convenience sampling of Micronesian migrants living in Hawai'i County focused on one population. Findings therefore may not be applicable to other groups including Micronesian migrants in other geographical areas. Although care was taken to sample a diverse segment of this population, the geographical isolation of island living amid the vastness of Micronesia could limit generalizability of the findings. The sample size of this pilot study and the limited time allotted for this project may also limit generalizability of the findings.

Implications for Practice

From the beginning of the project members of MU-BI made it evident they were willing to collaborate in a partnership for health promotion. Although unknown to MU-BI prior to this project, initial communication of interest in providing transcultural nursing assistance by this PIP director was met with invitations to all board meetings as well as to all community outreach and health activities. These included health fairs and activities designed to assist COFA citizens navigate the complexities of the HealthCare Marketplace. The enthusiastic welcome of the MU-BI members to the project director indicates a desire from Micronesian migrants to be more involved in collaborative healthcare solutions.

As noted previously, the healthcare community's ethnocentrism and lack of effective communication (Yamada, 2011) reflect a profound failure to achieve patient-centered care in this population. This pilot study demonstrated the enthusiasm and ingenuity of COFA citizens to partner for rational, tangible benefit to their community. The formal employment of a cultural advisor illuminated and validated the expertise required to gain an emic perspective. The acknowledgment of the inability of healthcare practitioners to solve the problem without this expertise encouraged the cultural advisor to provide critical and constructive criticism. This criticism ultimately resulted in the success of the project. This methodology could be utilized in other transcultural medical practice projects.

The importance of patient-centered care and the effects of socioeconomic disparities are only recent considerations in healthcare. It is the responsibility of the medical community to advocate for optimal health outcomes and to address socioeconomic disparities and injustices. One such injustice is that the COFA terms for providing Medicaid benefits for this population were changed *after* the treaties were signed. Recognizing the importance of education in

improving health outcomes and longevity (Marmot & Smith, 1991), the unjust designation by the University of Hawai'i system resulting in COFA citizens paying nonresident tuition demands advocacy by the healthcare community for recognition of their legal resident of Hawai'i status as determined by the same criteria as other legal residents. Transcultural patient-centered care is only achievable from an emic perspective. Socioeconomically disadvantaged populations merit social justice advocacy by the healthcare community in order to achieve better health outcomes. Healthcare providers must advocate for viable transculturally-informed options rather than provide ethnocentric, paternalistic instructions for care which may be medically sound but not achievable when socioeconomic and cultural considerations are factored into the decision-making process.

Contributions to Practice

Collaboration to improve health outcomes in this population may ultimately decrease the lifetime costs associated with the socioeconomic disparities exponentially increasing the risk for chronic conditions including obesity and diabetes. Healthcare must be affordable and accessible in order to be a viable option. Likewise, interventions must be culturally competent and patient centered for meaningful adoption in vulnerable populations. The current recommendations for standard diabetic footwear are cost prohibitive and culturally inappropriate in this population and in this climate. Congruent with findings from previous studies examining the prevalence of diabetes in the Micronesian population (Naseem, 2010), the project demonstrated a 47 percent incidence of diabetes, prediabetes, or risk for diabetes with seven percent owning diabetic shoes although none wore the shoes daily. These data demonstrate the lack of affordable options for safer footwear among Micronesian migrants in Hawai'i at risk for diabetic pressure-related foot

injury. The current preferred use of rubber slippers provides inadequate protection, while traditional diabetic footwear is culturally and economically infeasible.

This pilot study demonstrated the willingness of COFA citizens to become partners and to quickly alter the perception of an external locus of control in order to commit to a plan of action to provide better health outcomes. In the future, the design and construction of diabetic footwear should be tailored to include financial, cultural and climate considerations, and the population should be collaboratively engaged in the design.

Suggestions for Practice

Cultural adaptations are required for successful promotion of self-management of chronic conditions including obesity and diabetes. Collaboration with COFA stakeholders such as MU-BI will afford better outcomes for Micronesian citizens and better utilization of healthcare resources as a whole. As noted previously, the healthcare community has failed to engage this population largely due to Western medicine ethnocentrism and paternalism. The tacit compliance of healthcare providers with paternalistic approaches to lifestyle changes must be replaced by a paradigm shift to partnership with patients and communities in order to make primary and secondary prevention successful.

Future Projects

Micronesian migrants face significant health disparities. Given the paucity of research in this population, there are many possibilities for future projects. Collaboration with advocacy groups such as MU-BI would allow research into emic perceptions of lifestyle choices including diet and exercise as primary prevention with better overall health outcomes. As regards this PIP, further projects utilizing a participant pool greater than that afforded in this pilot study would allow for research into procurement of shoe soles with heel recesses as well as involvement of

Micronesian manufacturers and artists in the modification and perhaps manufacture of footwear with accommodations to minimize the occurrence of pressure-related injury. Future projects could also include prototype testing on participants with diabetes and other exclusion criteria in this project.

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[features?source=search_result&search=diabetic+retinopathy&selectedTitle=1%7E132](https://www.uptodate.com/contents/diabetic-retinopathy-classification-and-clinical-features?source=search_result&search=diabetic+retinopathy&selectedTitle=1%7E132)

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Appendix A

Allostatic Load

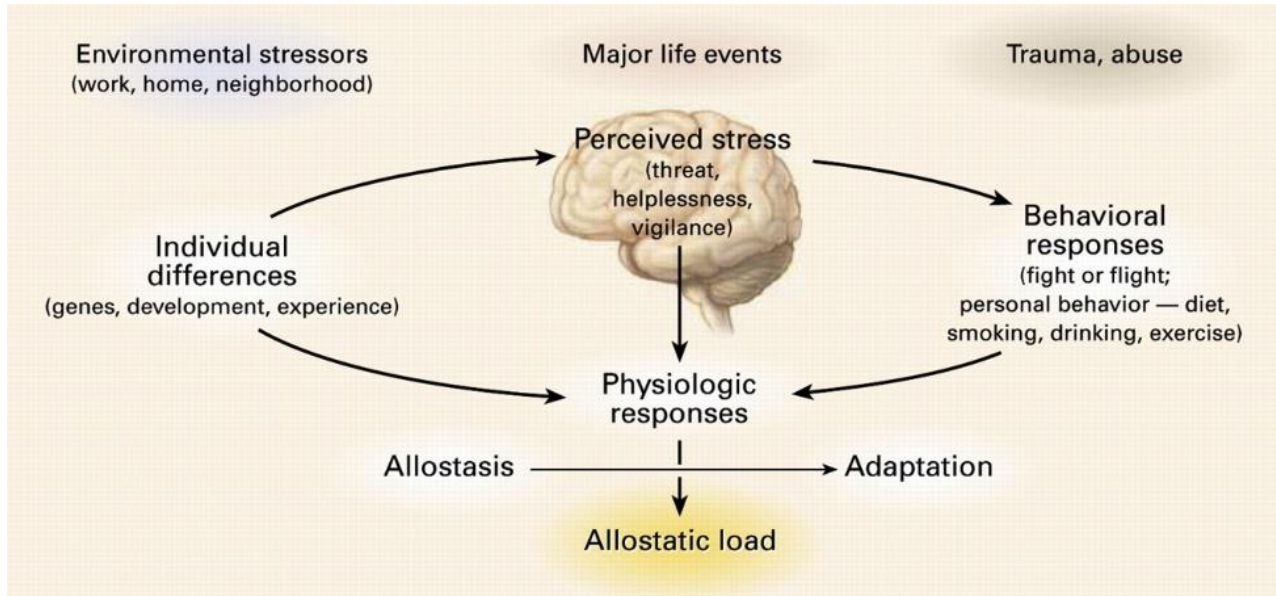


Figure 1 Central role of the brain in allostasis and the behavioral and physiological response to stressors (McEwen, 2007).

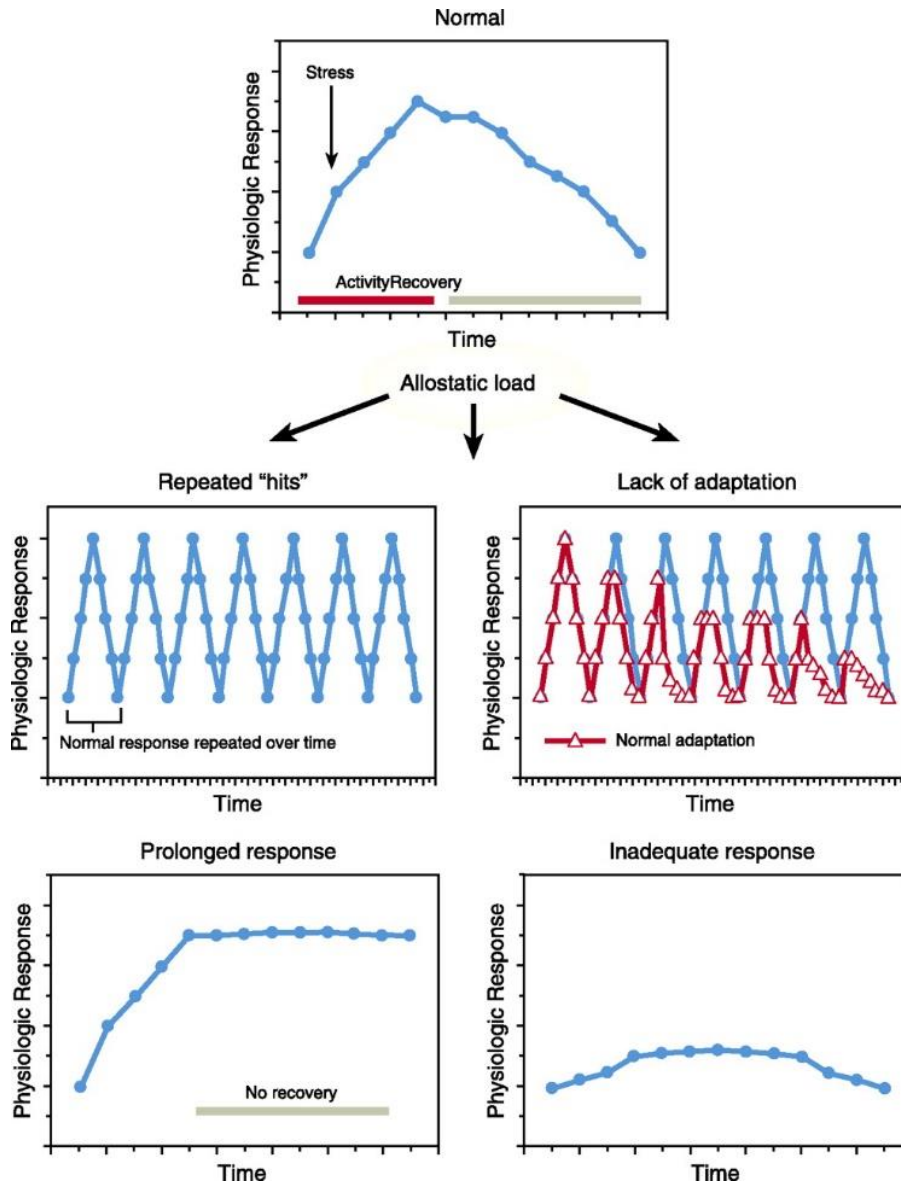
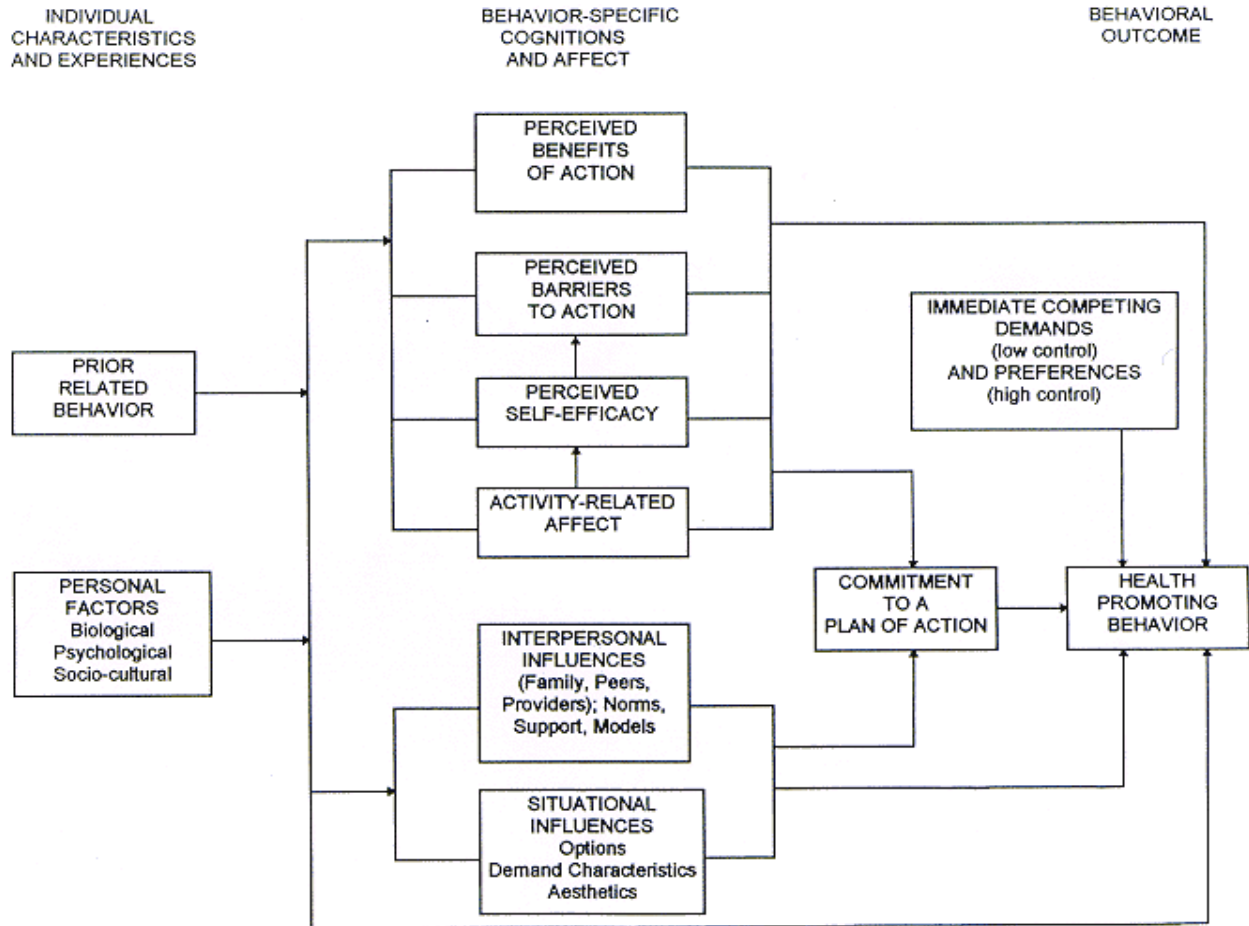


Figure 2 Four types of allostatic load. *Top panel:* illustrates the normal allostatic response, in which a response is initiated by a stressor, sustained for an appropriate interval, and then turned off. The remaining panels illustrate four conditions that lead to allostatic load: *top left*, repeated “hits” from multiple stressors; *top right*, lack of adaptation; *bottom left*, prolonged response due to delayed shut down; *bottom right*, inadequate response that leads to compensatory hyperactivity of other mediators (e.g., inadequate secretion of glucocorticoid, resulting in increased levels of cytokines that are normally counter regulated by glucocorticoids). (McEwen, 2007).

Note: Reprint license 4001050025492 from Elsevier obtained December 2, 2016.

Appendix B

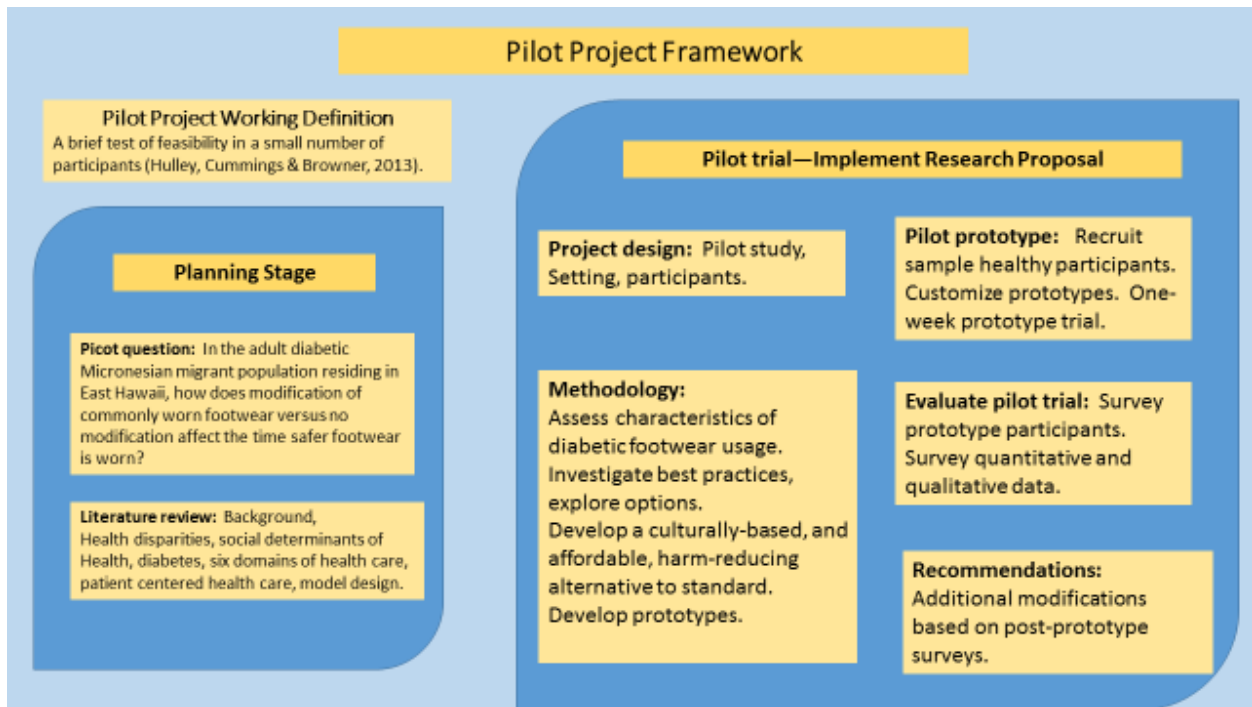


Revised Health Promotion Model

The Health Promotion Model (1996) from Pender’s website,
www.nursing.umich.edu/faculty/pender/chart.gif, retrieved May 7, 2016).

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Appendix C



Appendix D**Survey #1**

Please check the best answer.

1. Gender

- Male
- Female

2. Age

- 18-34
- 35-49
- 50-64
- Over 65
-

3. Have you ever been told you have

- Diabetes
- Prediabetes
- Risk for diabetes
- None of the above

4. Have you ever owned special diabetic shoes?

- Yes
- No. If no, skip to question 7

5. Do you like your diabetic shoes?

- Yes
- No

6. How often do you wear your diabetic shoes?

- Every day
- Most days
- Some days

- Rarely
- Never

7. What is your favorite thing to wear on your feet?

- I like to go barefoot
- I like to wear socks only
- I like to wear rubber slippers
- I like to wear rubber slides
- I like to wear tennis shoes



Rubber slippers



Rubber slides



Tennis shoes

8. Do you own any of the following? Check all that apply

- Rubber slippers
- Rubber slides
- Tennis shoes
- Walking sandals



Walking sandals

9. What is your favorite sandal?

- Locals
- Crocs

- Closed-toe toe Crocs
- Other
- Do not have a favorite



Locals



Crocs



Closed-toe Crocs

10. Have you ever had a pressure sore or injury to your foot?

- Yes, from rubber slippers
- Yes, from other sandals
- Yes, from other shoes
- Not sure
- No, I have never had a pressure injury to my foot.

11. If you were advised to wear diabetic shoes, what would be most important to you? You may choose more than one. Please number order of importance such as 1, 2, 3.

- _ Cost
- _ Comfort
- _ Closed shoe
- _ Sandal
- _ Appearance
- _ Traveling to be measured for fit

- _ Waiting for shoes
- _ Micronesian supplier

Appendix E**University of Hawai'i****Consent to Participate in a Research Project**

Joyce Norris-Taylor, Principal Investigator

Project title: Evaluation of Footwear in Diabetic Micronesian migrants

Aloha! My name is Joyce Norris-Taylor and you are invited to take part in a research study. I am a graduate student at the University of Hawai'i at Hilo in the School of Nursing. As part of the requirements for earning my graduate degree, I am doing a nursing research project. The purpose of my project is to evaluate footwear choices and modifications to provide safer alternatives footwear choices. I am asking you to participate because you are at least 18 years old, and you are a Micronesian migrant living in East Hawai'i.

Project Description – Activities and Time Commitment: If you decide to take part in this project, you will be asked to fill out a survey. The survey questions are multiple choice. This is a paper survey which I will provide you once you have read and understood this consent form, and asked any questions about the study. Completing the survey will take approximately 20 minutes. I expect around 25 people will take part in this project.

Benefits and Risks: There will be no direct benefit to you for taking part in this project other than a \$5.00 Wal-Mart gift card. The findings from this project may help create a better understanding of the wishes and needs regarding shoes for diabetic Micronesian migrants. There is little risk to you for participating in this project.

Confidentiality and Privacy: I will not ask you for any personal information, such as your name or address. Please do not include any personal information in your survey responses.

Voluntary Participation: You can freely choose to take part or to not take part in this survey. There will be no penalty or loss of benefits for either decision. If you do agree to participate, you can stop at any time.

Questions: If you have any questions about this study, please call or email me at (808) 769-2225 and joycenor@Hawai'i.edu. You may also contact my advisor, Dr. Tracy Thornett, at (808) 932-7067 and thornett@Hawai'i.edu. If you have questions about your rights as a research participant, you may contact the UH Human Studies Program at (808) 956-5007 or uhirb@Hawai'i.edu.

Filling out the survey will be considered as your consent to participate in this study. Please keep this page for your records. Mahalo!

Appendix F

Survey #2

1. Do you like the shoes you trialed?
 - Yes
 - No

2. About how many days did you wear the shoes?
 - Daily
 - Every other day
 - Two days
 - One day
 - I did not wear the shoes

3. About how long did you wear the shoes?
 - Less than an hour at a time
 - About two hours at a time
 - About three hours at a time
 - About half a day
 - All day

4. Would you like to continue wearing the shoes?
 - Yes
 - No

5. Would you like to keep the shoes?
 - Yes
 - No

6. Did you find the shoes to be comfortable?
 - Yes
 - No

7. Do you have any comments about participating in this study?

Appendix G



University of Hawai'i

Consent to Participate in a Research Project

Joyce Norris-Taylor, Principal Investigator

Project title: Evaluation of Footwear in Diabetic Micronesian migrants

Aloha! My name is Joyce Norris-Taylor and I would like to thank you for taking part in this research study. I am a graduate student at the University of Hawai'i at Hilo in the School of Nursing. As part of the requirements for earning my graduate degree, I am doing a nursing research project. The purpose of my project is to evaluate footwear choices and modifications to provide safer alternatives. I asked you to participate because you are at least 18 years old, and you are a Micronesian migrant living in East Hawai'i.

Project Description – Activities and Time Commitment: If you decide to take part in this project, you will be asked to provide footwear preferences and measurements after which you will participate in a trial of wearing footwear modified to be safer for a one week period and then to fill out a survey once the trial is completed. The survey questions are multiple choice with one open-ended question at the end for any comments. This is a paper survey which I will provide you once you have read and understood this consent form, and asked any questions about the study. Completing the survey will take approximately 20 minutes. I expect around 5-10 people will take part in this project.

Benefits and Risks: There will be no direct benefit to you for taking part in this project other than a \$20.00 Wal-Mart gift card and the opportunity to keep the trial footwear. The findings from this project may help create a better understanding of the wishes and needs regarding shoes for diabetic Micronesian migrants. There is little risk to you for participating in this project. Some risks are that the shoe may be uncomfortable and may not fit properly. Like any new footwear, risks include being more harmful than old shoes.

Confidentiality and Privacy: I will require name and contact information should you chose to participate in this trial of footwear. Please do not include any personal information in your survey responses. Contact information will be confidential and will be deleted at the conclusion of this project.

Voluntary Participation: You can freely choose to take part or to not take part in this survey. There will be no penalty or loss of benefits for either decision. If you do agree to participate, you can stop at any time.

Questions: If you have any questions about this study, please call or email me at (808) 769-2225 and joycenor@Hawai'i.edu. You may also contact my advisor, Dr. Tracy Thornett, at (808) 932-

7067 and thornett@Hawai'i.edu. If you have questions about your rights as a research participant, you may contact the UH Human Studies Program at (808) 956-5007 or uhirb@Hawai'i.edu.

Providing contact information and filling out the survey will be considered as your consent to participate in this study.

Please keep this page for your records.

Mahalo!

Appendix H



UNIVERSITY
of HAWAII®
SYSTEM

Office of Research Compliance
Human Studies Program

TO: Thornett, Tracy, DNP, University of Hawaii at Hilo, School of Nursing
Davis, Alice, University of Hawaii at Hilo, School of Nursing, Norris-Taylor, Joyce, BSN, University of Hawaii at Hilo, School of Nursing

FROM: Magno, Norman, Dir, Animal Welfare and Biosafety Prog, Intm Dir Human Stds Prog, Biomedical IRB

PROTOCOL TITLE: Transcultural Nursing Approach to Secondary Prevention of Pressure-Related Foot Injury in Micronesian Migrants in Hawaii with Type 2 Diabetes Mellitus

FUNDING SOURCE: NONE

PROTOCOL NUMBER: 2016-31094

APPROVAL PERIOD: Approval Date: February 23, 2017 Expiration Date: February 22, 2018

NOTICE OF APPROVAL FOR HUMAN RESEARCH

Your research project identified above meets all applicable federal criteria for approval of human subject research, including the informed consent/privacy authorization form, was approved for one year by the University of Hawaii Institutional Review Board (UH IRB) at its IRB meeting on January 18, 2017.

This memorandum is your record of the IRB approval of this study. Please maintain it with your study records.

The UH IRB approval for this project will expire on February 22, 2018. If you expect your project to continue beyond this date, you must submit an application for renewal of this Human Studies Program approval. The Human Studies Program approval must be maintained for the entire term of your project.

If, during the course of your project, you intend to make changes to this study, you must obtain approval from the Human Studies Program prior to implementing any changes. If an Unanticipated Problem occurs during the course of the study, you must notify the Human Studies Program within 24 hours of knowledge of the problem. A formal report must be submitted to the Human Studies Program within 10 days. The definition of "Unanticipated Problem" may be found at the HSP Policies & Guidance website, www.hawaii.edu/researchcompliance/policies-guidance, and the report form may be downloaded from the website www.hawaii.edu/researchcompliance/report-protocol-violation-or-unanticipated-problem.

You are required to maintain complete records pertaining to the use of humans as participants in your research. This includes all information or materials conveyed to and received from participants as well as signed consent forms, data, analyses, and results. These records must be maintained for at least three years following project completion or termination, and they are subject to inspection and review by Human Studies Program and other authorized agencies.

Please notify this office when your project is completed. Upon notification, we will close our files pertaining to your project. Reactivation of the Human

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Biomedical Sciences Building B104
Honolulu, Hawaii 96822
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**Office of Research Compliance
Human Studies Program**

Please contact this office if you have any questions or require assistance. We appreciate your cooperation, and wish you success with your research.

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Appendix I

Budget

Item	Estimated Cost	Final Cost
Gift Cards	\$450	\$470
Printing	\$25	\$15
Interpreter/cultural advisor	\$400	\$400
Footwear modification supplies	\$400	\$410.25
Total	\$1275	\$1295.75

Appendix J**Timeline**

February 15-28, 2017	Initial survey distribution and recruitment
March 1-8, 2017	Development of prototypes and distribution to participants
March 9-18, 2017	Prototype trial
March 18-27, 2017	Evaluation of results
April 10, 2017	Presentation of project

Appendix K

Prototype-Testing Participants' Survey Comments

Survey #	Comment
1	I would like to see some way to remove the covering so it could be washed. Other than that, I thought it was wonderful. Maybe your next one you could make it with a back cover like a strap to cover the heel so they don't slide off.
2	I am wearing them around the house when I get home from work. I think my comment is I think it is a good thing for people to help people wearing shoes safely. I think they are very comfortable. They are better than regular slippers. I think that for the Micronesian community there is going to be a use for people to learn how to make it, especially. For folks in the community, it could be a business for somebody and could be a community relief for people who are needing something like this.
3	I really like the padding because I was always getting blisters from the rubber slippers. I was hoping there was going to be more, maybe stepping up the process. I wish there were some other places, I wish I could get to see more of it. I love the fact that we could actually wash the cloth and insert changeable if you want. We can always put on our own or just take it off and use it the way we like.
4	I'll think about it. Well to me, it's pretty comfortable. I would wear them.
5	I'm using it. It's really good, nice and soft, very attractive. I don't use it workdays at work but I wear it on the weekends. I think you have to make sure the decorations do not go down where you have the toe. It was perfect for me but if it was for some folks with sickness it might cause a blister.
6	Maybe it should have a foam around the design or covered by plastic so it's more durable under weather conditions.
7	The cloth looks like it can come off, but good for inside the house.
8	Nice and beautiful but should be waterproof.
9	It's comfortable & nice but I can't wear it outside in the rain.
10	No comment.