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An Overview of Diabetes and Community Health Concerns in Guatemala

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AN OVERVIEW OF DIABETES AND COMMUNITY HEALTH CONCERNS IN GUATEMALA

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Abstract

Type 2 diabetes mellitus (T2DM) has emerged as a worldwide epidemic in recent years. Rates of this disease continue to rise annually. While many countries have adequate access to prevent and treat T2DM, developing countries often lack education and resources to combat the diabetes epidemic. This shortcoming results in alarming rates of uncontrolled T2DM cases among individuals in developing countries, namely, Guatemala. Additionally, the lack of resources in Guatemala results in a myriad of other health disparities beyond T2DM including deficiencies in sanitation and adequate nutrition. This community service project specifically aims to address the disproportionate burden of T2DM, sanitation, and malnutrition that affects the patients of the Corazon de Amor Health Clinic in Guatemala City, Guatemala.

Through communication with staff at Corazon de Amor Health Clinic, the research team determined that educational resources regarding sanitation, malnutrition, and T2DM were lacking. Patients were being educated on a case-by-case basis, but educational tools were not being displayed or readily distributed to the entire population. The research team determined that the clinic waiting room would be an ideal location to display malnutrition and sanitation health information considering the high patient traffic and abundance of wall space for easy display in this area. By printing and displaying educational posters about malnutrition and sanitation in the busy clinic waiting room, the goal of providing preventative health education to the patient population at Corazon de Amor Health Clinic was accomplished.

To address the need for education on T2DM, the research team adapted bilingual material accessed from the National Institute of Diabetes and Digestive and Kidney

Diseases (NIDDKD) into PowerPoint format. The NIDDKD material was then used to create a 3-day educational course for current diabetic patients of the clinic. Additional diabetic educational materials were also created and provided to the clinic to be used at their discretion in the future. All materials were proposed and accepted by staff at the Corazon de Amor Health Clinic. Further use of the provided T2DM, sanitation, and malnutrition materials will be utilized at the discretion of the clinic staff.

Acknowledgements

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Chapter 1: Introduction

Introduction

Guatemala's historical divide as a nation and current healthcare dysfunction contribute to the multitude of preventable epidemics plaguing its people. The Guatemalan healthcare system itself is flawed due to the lack of government funding, shortage of workers, and barriers to access, specifically in regards to rural populations (Avila et al., 2015). The negative impacts of these factors is best reflected by the two-fold increase of type 2 diabetes mellitus (T2DM) mortality from 2005-2014 (Pan American Health Organization [PAHO], 2014). With T2DM currently ranked as the fourth leading cause of mortality in Guatemala, a lack of preventative treatment and education are surely to blame (Bream et al., 2018). Furthermore, the absence of education and preventative treatment surrounding malnourishment and sanitation contribute to nearly 50% of children in Guatemala experiencing stunting (World Health Organization [WHO], 2018a). In the following paper, the progression, impact, and challenges surrounding T2DM, malnourishment, and sanitation will be emphasized. Chapter two will be the basis supporting interventions aimed to increase education and preventative care at the Corazon De Amor Health Clinic, La Limonada school, and Santa Faz community center in Guatemala.

Background to the Problem

Guatemala's history has been plagued by suffering, corruption, and civil war. As a result, interpersonal violence has historically been a significant cause of mortality in Guatemala. More recently, however, mortality attributed to interpersonal violence has plummeted to an all-time low (PAHO, 2014). The 2017 mortality rate in Guatemala was

significantly lower than the global average, by a staggering 43% (Central Intelligence Agency [CIA], 2018a). Death rates have remained relatively constant since 2005 with an average 60,000 deaths per year (PAHO, 2014). As violence-related deaths continue to drastically decrease across the country, a combination of respiratory infections and influenza remained the leading cause of death in children (PAHO, 2014). Furthermore, alarming trends suggest that the rate of both T2DM and ischemic heart disease have increased by 200% in Guatemala, accounting for approximately 19% of all combined deaths in 2014 (PAHO, 2014). To compound the problem, the World Health Organization (WHO) reports that a significant portion of the population is identified as having elevated health risk factors such as hypertension, hyperglycemia, obesity, and tobacco use (WHO, 2015).

The persistence of mortality in regards to respiratory infections, T2DM, and other preventable illnesses is largely in part due to the dysfunctional and underfunded healthcare system. Public healthcare is free to the people, but often of poor quality and without adequate resources. Private healthcare is usually of better quality than public; however, private healthcare is out of reach for many of Guatemala's poor citizens due to cost. An underfinanced and dysfunctional healthcare system along with other limiting factors including language barriers and cultural divide have caused there to be a drastic increase in T2DM over the last 15 years, as well as continuing problems with malnutrition and sanitation.

Diabetes mellitus is a growing epidemic in Guatemala. As of 2014, 12.4% of Guatemalans were considered physically inactive, 47.7% were overweight, and 7.5% of all Guatemalans met the diabetic diagnosing criteria (WHO, 2016). Annual trends show

that the prevalence of diabetes has increased at a steady rate since 1980, and projections estimate that the rate of diabetes will continue to rise unless interventions are made (WHO, 2016). The aforementioned trends and projections are based on the fact that the majority of Guatemalans possess multiple diabetic risk factors while simultaneously lacking appropriate education for prevention (Flood et al., 2016).

The diabetes epidemic creates a disproportionately large burden in Guatemala, as Guatemalan clinics often lack access to many of the appropriate tools for diagnosing diabetes. Hemoglobin A1C tests, which are typically the gold standard for diabetes diagnosis, are extremely uncommon in Guatemalan clinics due to lack of technology and their high expense (Flood et al., 2016). Other basic tools that are often helpful in diabetic examinations like tuning forks, ophthalmoscopes, doppler ultrasound machines, and urine test strips, are seldom available, leading to increased morbidity and mortality (WHO, 2016). Many other barriers to diabetic care exist in Guatemala, including lack of transportation, language barriers, and especially lack of appropriate healthcare literacy among patients (Esterson, Cary, Piette, Thomas, & Hawkins, 2014).

Due to these barriers, diabetic complications are more common in Guatemalans (Flood et al., 2016). Common complications include diabetic retinopathy, stroke, limb amputation and end-organ damage (WHO, 2016). As healthcare related technology is generally limited in Guatemala, most clinics lack the appropriate resources to treat many of these complications, leading to increased diabetic related morbidity and mortality (WHO, 2016). Due to the lack of resources for treatment, the most effective efforts in Guatemala focus primarily on prevention of diabetes (Hu, 2011). One preventative measure that is practical and financially feasible is educating children and families on

appropriate diet. The impact of this intervention is two-fold, as it would address the T2DM epidemic while also improving malnourishment in children (Dagogo-Jack, 2006).

Guatemala possesses the highest rate of malnourishment among all countries within the borders of South and Central America (World Bank, 2018). Malnourishment disproportionately burdens the poorest quintile, pregnant women, the indigenous population, and young children (World Bank, 2018). Nearly half of all Guatemalan children are negatively impacted by the lack of proper nourishment causing varying degrees of temporary and permanent stunting (WHO, 2018a). Additionally, more than 33% of women develop anemia during pregnancy due to prolonged iron deficiency (Director-General for International Cooperation and Development [European Commission], 2015). The disparity of malnourishment and stunting extends further into poverty as the rate of stunting in underprivileged populations is four times greater than the top wealth quintile (World Bank, 2018). Moreover, more than 70% of the Guatemalan indigenous population reluctantly bears the burden of undernourishment (European Commission, 2015).

The economic effects of malnourishment in Guatemala have been crippling the country at an expense of nearly $10 million dollars daily consequential to extensive illness, sick leave, decreased work productivity, and increased primary school failure rates (European Commission, 2015). According to the WHO, the effects of chronic undernourishment throughout Guatemala are detrimental to cognitive function, physical capacity, educational accomplishment, productivity, income potential, and health (WHO, 2018a). According to World Bank, the strain of malnourishment is further exacerbated

from frequent diarrheal illness due to the numerous, insufficient water sources, sanitation practices, and hygiene methods (World Bank, 2018).

Access to improved sanitation and water resources has been measured for nearly 30 years in Guatemala. Millennium Development Goals (MDGs) were first set for each of these metrics 1990. By 2014, Guatemala had exceeded the target goal of 88.5% for access to improved water as 91% of the population met this criteria (World Bank, 2018). However, rural departments starkly contrast urban departments in regards to improved water access as a mere 61% of rural respondents report access to improved water resources (World Bank, 2018). Meanwhile, Guatemala continues to struggle with improving access to sanitation for its people.

In 2014, just 53% of the Guatemalan population reported access to improved sanitation, which was 12.5% short of the MDG of 65.5% (World Bank, 2018). Urban departments in Guatemala exceeded this goal with an average of 81% of respondents reporting access to improved sanitation; however, rural departments fell far short with just 26% having access to improved sanitation (World Bank, 2018). Furthermore, just 19% of extremely poor citizens in Guatemala reported access to improved sanitation (World Bank, 2018).

The water and sanitation disparities facing rural and impoverished populations in Guatemala directly contribute to diarrheal diseases, which are the second leading cause of death in children. Additionally, stunting and malnourishment are direct consequences of poor water quality and lack of access to sanitation (World Bank, 2018). The Sustainable Development Goals created in 2015 highlight continued efforts to improve access to

water and sanitation resources, which should correspond with less diarrheal diseases, malnutrition, stunting, and better overall health for the citizens of Guatemala.

Problem Statement

Type 2 diabetes mellitus is a worldwide epidemic that is the fourth leading cause of death in Guatemala (Bream, et al., 2018). This is largely due to a lack of resources detailing preventative measures. Likewise, knowledge deficiencies surrounding malnutrition and the importance of sanitation and water resources result in numerous preventable diseases and poor health outcomes throughout Guatemala.

Needs Assessment

The partnering organization for this project is Corazon de Amor Health Clinic. Literally meaning "Heart of Love", the non-profit clinic brings healthcare and medicine to those living in Zone 3 of Guatemala City. The clinic was started by Dr. Layla Perez as the result of a desire to reach the underserved communities living in and around the city's massive garbage dump. The mission of Corazon de Amor is to serve the physical and spiritual needs of this impoverished community and use healthcare as a way to express the love of Christ (A. Bockstahler, personal communication, October 9, 2018).

The clinic first opened six years ago. Since then, two phases of building construction have been completed to create a functional two story medical clinic. Looking forward, a third phase is in the works to add a third level to the cinderblock building (A. Bockstahler, personal communication, October 9, 2018). The majority of those served by the clinic live in extreme poverty. The community living in and around the garbage dump includes about 10,000 children and adults, many of which have migrated from rural areas in search of work (A. Bockstahler, personal communication,

October 9, 2018). When families are unsuccessful in finding work in the city, many end up in the garbage dump to scavenge for recyclable items, in hopes of surviving.

Through communication with an American nurse missionary working closely with Dr. Layla at the clinic, several needs of the clinic and the population it serves have been identified. Needs of the population include malnutrition in children and adults, an increasing prevalence of type two diabetes and hypertension, lack of prenatal care, and lack of sanitation (A. Bockstahler, personal communication, October 9, 2018). As a result, the clinic desires to provide care for these needs. However, the overwhelming number of patients cared for at the Corazon de Amor Health Clinic limits the amount of time that can be spent by clinic staff developing preventative education and providing preventative care (A. Bockstahler, personal communication, August 29, 2018). In order to serve both the clinic and those it so humbly cares for, three needs have been chosen to focus on for this project: malnutrition, diabetes, and sanitation.

Significance of the Problem as it Relates to the Health Care System

Providing quality healthcare for its citizens has been a century-long struggle for Guatemala (Avila et al., 2015). A host of problems including language barriers, lack of funds, lack of providers, government corruption, and lack of preventative medicine contribute to Guatemala's healthcare problems as a whole. The shortage of quality healthcare accounts for the ever increasing prevalence of T2DM and other preventable diseases (PAHO, 2018). As a result of the high levels of poverty and under-funding that afflict the Guatemalan people and healthcare system, preventative education has emerged as the most effective way to combat three of Guatemala's major healthcare needs: T2DM, malnutrition, and sanitation (Avila et al., 2015). Providing preventative education to the

patients of the Corazon de Amor Health Clinic would help to lower rates of T2DM, malnutrition, and sanitation-related disease, therefore improving the lives of patients as well as lightening the burden of the clinic staff.

Purpose

As a result of the current Corazon de Amor Health Clinic needs assessment, the project goal is designed to make a progressive impact throughout multiple Guatemalan communities in an effort to stifle the growing diabetes mellitus epidemic. Furthermore, the project goal aims to positively influence the community through the reduction of widespread childhood and adult malnourishment. Currently, the Corazon de Amor Health Clinic staff lacks the necessary resources to provide adequate preventative healthcare to their enormous patient population (A. Bockstahler, personal communication, October 9, 2018). The project aims to support Corazon de Amor Health Clinic with enduring health resources and education directed towards reducing diabetes mellitus risk factors, cultivating sanitation techniques, and promoting improved nutrition.

Definition of Terms

The following terms are defined for the purposes of our study:

- *Child* is a young male or female below the age of puberty.
- *Developing country* is defined as "a country with little industrial and economic activity and where people generally have low incomes" (Cambridge University Press, 2018a).
- *Diabetes mellitus* is defined as "a variable disorder of carbohydrate metabolism caused by a combination of hereditary and environmental factors and usually characterized by inadequate secretion or utilization of insulin, by excessive urine production, by excessive

amounts of sugar in the blood and urine, and by thirst, hunger, and loss of weight" (Merriam-Webster Incorporated, 2018a).

- In Guatemala, *extremely poor citizens* or *the extreme poverty line* are defined as "the amount needed to purchase a basket of food" (World Bank, 2016).
- *Improved drinking water* is defined as "A source that, by nature of its construction, adequately protects the water from outside contamination, in particular from fecal matter" (WHO, 2012a).
- *Improved sanitation* is defined as "sanitation facilities that hygienically separate human excreta from human contact" (WHO, 2012a).
- *Indigenous* is defined as "existing naturally or having always lived in a place; native" (Cambridge University Press, 2018b).
- *Malnutrition* is defined as "deficiencies, excesses, or imbalances in a person's intake of energy and/or nutrients. The term malnutrition addresses 3 broad groups of conditions: undernutrition, which includes wasting (low weight-for-height), stunting (low height-for-age) and underweight (low weight-for-age)..." (WHO, 2018b).
- *Non-governmental organizations (NGOs)* are any volunteer group created by citizens of a community to impact local or international individuals (Avila et al., 2015).
- In Guatemala, *poor citizens* or *the poverty line* are defined as having "an income that is insufficient to purchase a basic basket of goods and services" (World Bank, 2016).
- The *Programa de Cobertura de Extension* or *Extension of Coverage Program (PEC)* was a program created by the Guatemalan government to extend healthcare to underserved rural areas (Avila et al., 2015).

- *Student* is defined as a Corazon de Amor Health Clinic patient that attended the diabetes training provided by the researchers.
- *Stunting* is defined as "the impaired growth and development that children experience from poor nutrition, repeated infection, and inadequate psychosocial stimulation. Children are defined as stunted if their height-for-age is more than two standard deviations below the WHO Child Growth Standards median" (World Health Organization, 2018c).
- *Surface water* is defined as "natural water that has not penetrated much below the surface of the ground : drainage water" (Merriam-Webster Incorporated, 2018b).
- *Type 2 diabetes mellitus (T2DM)* is defined as "a common form of diabetes mellitus that develops especially in adults and most often in obese individuals and that is characterized by hyperglycemia resulting from impaired insulin utilization coupled with the body's inability to compensate with increased insulin production" (Merriam-Webster Incorporated, 2018c).

Conclusion

Guatemala faces many challenges as a low-income developing country, including lack of sanitation, severe burden of malnutrition, and a disproportionate diabetes epidemic. Healthcare problems are compounded by various factors: the minimal availability of healthcare facilities and employees, absence of medical supplies and equipment, and lack of government support for preventative health measures (Avila et al., 2015). These three issues are inherently linked and can be addressed and potentially eradicated if appropriate education is provided. This possibility urges the importance of implementing preventative health measures, specifically dietary and lifestyle

modifications, to address the health disparities that Guatemala faces (Dagogo-Jack, 2006). The literature review in chapter two begins with an overview of Guatemala. The geography, cultural background, economy, and history of the country are explained to provide better understanding of the current healthcare system and mortality in Guatemala. After providing Guatemala's background, evaluation of some of the healthcare disparities facing this country will follow. Guatemala's issues with appropriate sanitation, malnutrition, and T2DM will be addressed.

Chapter 2: Literature Review

Introduction

This literature review aims to highlight the healthcare disparities in Guatemala. A general overview of the country's background, overall mortality rates, and healthcare system are provided in order to give a foundation for the specific disparities described. A more descriptive analysis of type two diabetes mellitus (T2DM), malnutrition, and sanitation will illustrate these disparities in further detail.

Background of Guatemala

Guatemala, located in Central America, is bordered by El Salvador, Honduras, Belize, and Mexico and is surrounded by the Caribbean Sea to the east and Pacific Ocean to the west. Guatemala has a unique geographical landscape consisting of rainforests, beaches, volcanos, and beautiful central highlands that separate it from other countries in the region (Griffith, Horst, Anderson, & Stansifer, 2018). While Spanish is the official language of Guatemala, 22 indigenous languages with different dialects are spoken throughout the country (Pan American Health Organization [PAHO], 2015a). This presents a unique challenge to anyone attempting to reach Guatemalans as a whole. Guatemala is made up of incredible ethnic diversity, reflecting both their history of Mayan descent and time of Spanish colonial reign. According to World Population Review, 41% of Guatemalans qualify as being Ladino, implying descent from both indigenous and European backgrounds (World Population Review, 2018). Eighteen percent of those who call Guatemala home are whites of European descent, often descendants of those who settled in Guatemala from Spain and Germany (World Population Review, 2018). The indigenous population makes up 40% of Guatemalans;

however, this large population suffers from intense marginalization characterized by disparities in access to healthcare and quality health outcomes (Avila et al., 2015).

Although Guatemala is not the largest Central American country in terms of land, it does boast the largest economy (Avila et al., 2015). Guatemala also has the largest population in Central America at 16.58 million people, 49% of which live in rural areas (Avila et al., 2015). In 2016, 36% of Guatemala's population was under fifteen, while those over 65 made up only 5% (PAHO, 2015a). The literacy rate in Guatemala is 78% as a whole, and 94% among those age 15-24, with females having two times greater of a chance to be illiterate than their male counterparts (Avila et al., 2015). This presents increased difficulty to those seeking healthcare and health education.

According to the PAHO, 68% of people in 2014 worked in the informal sector, meaning their work was neither taxed nor monitored by any form of government (PAHO, 2015a). Of those 68%, the majority worked as subsistence farmers which is representative of the nation's struggle with widespread poverty (PAHO, 2015a). The PAHO estimates that 59.3% of people in Guatemala live in poverty, which is defined as less than 10,218 quetzals (Guatemala's national currency) per year, or 1,327 USD (PAHO, 2015a). Of the 59.3% that live in poverty, 13% live in extreme poverty (Avila et al., 2015). As a result of this destitution, many Guatemalans are rapidly migrating to urban areas, especially Guatemala City (PAHO, 2015a). Consequently, Guatemala City is unable to provide goods and services to all its citizens, including those living on the outer edges of the city (PAHO, 2015a).

The history of Guatemala has been deeply scarred by political unrest and the suffering of its people. On September 15, 1821 Guatemala gained independence after

three centuries as a Spanish colony (Central Intelligence Agency [CIA], 2018b). Following separation from Spain, authoritarian and military rule dominated the political scene (Griffith et al., 2018). In March of 1951, Jacobo Árbenz was elected president of Guatemala (Encyclopedia Britannica, 2018). His political platform focused mostly on "agrarian reform", calling for the reassignment of land back to the local farmers of Guatemala (Encyclopedia Britannica, 2018). Unfortunately, this was intensely opposed by one of Guatemala's greatest landowners, The United Fruit Company, whose unused lands Árbenz wish to redistribute (Encyclopedia Britannica, 2018). The United Fruit Company (now Chiquita Brands International) was an American-owned and operated corporation that had made a fortune selling bananas grown on Central American soil (Livingston, 2013). The United Fruit Company had several close ties to the US government, namely the CIA (Schoultz, 1998, p. 338). At the same time, tensions surrounding communism were running high in the United States and all officials were on high alert. As a result, the United States took a special interest in the happenings of Guatemala due to Árbenz's close ties with the "communist bloc of nations" (Encyclopedia Britannica, 2018). The US Government began a public campaign to defeat Arbenz and stop communist advancement in Guatemala (Encyclopedia Britannica, 2018).

On the morning of June 18, 1954, as a part of a plan to overthrow Arbenz, the CIA covertly dropped paper leaflets in Guatemala City demanding the resignation of the president (Moore, 2010). With tensions high, a 36 year civil war and genocide was sparked in which many indigenous Guatemalans suffered tremendously. Mayan men, women, and children would be arbitrarily tortured and killed by the military of those who

came into power (PBS News Hour, 2011). It has been estimated that over 200,000 Guatemalans lost their lives during the war and more than 1,000,000 became refugees (CIA, 2018b). Of those killed and fully identified, 83% were indigenous Mayans (Historical Clarification Commission, 1999).

As a result of this massive genocide, Mayans today are still struggling to rebuild their lives, families, homes, and culture. Due to the oral nature of Mayan society, the loss of such a large fraction of indigenous people has left survivors without basic knowledge of their history, culture, language, and herbal medicinal and conventional healthcare practices which are passed down from generation to generation (Moffett, 2018). Since the end of the civil war there have been a number of "high-profile scandals" and acts of corruption that have damaged the government's reputation and resulted in a "crisis of confidence" among the people of Guatemala (Avila et al., 2015).

Mortality in Guatemala

Guatemala is a predominately disadvantaged country where poverty, the exploding population, and inadequate health care are inextricably linked. The world's average death rate in 2017 was estimated at 7.7 deaths per 1,000 citizens (CIA, 2018a). Currently, Guatemala sits below the world's annual mortality average with 4.4 deaths per 1,000 citizens (CIA, 2018a). The majority of these deaths are considered preventable or treatable with proper access to health care (PAHO, 2015b). In 2015, Guatemalan males were expected to live an average of 70.64 years while females were predicted a longer life expectancy of 77.13 years (PAHO, 2015b). Of the many risk factors impacting longevity, cardiovascular disease was found to be influential in reducing life expectancy for men and women by approximately three to four years (PAHO, 2015b). A significant

portion of Guatemala's mortality rate in 2002 was comprised of nearly 16,000 infant deaths. By 2012, the infant casualty rate plummeted by nearly 30% due to a variety of factors including increased perinatal healthcare (World Health Organization [WHO], 2018d). The decline in infant deaths as a result of asphyxia and trauma during delivery can be attributed to the amplified use of skilled health professionals during 51% of all births nationwide (WHO, 2015).

Mortality can be impacted in a number of ways such as non-communicable disease, communicable disease, and injury to include homicide, suicide, and accidental death. In 2012, the primary cause of Guatemalan deaths of all age groups and genders were initiated by a blend of diseases and violence in the following order of prevalence: lower respiratory infections, interpersonal violence, ischemic heart attacks, diabetes mellitus, human immunodeficiency virus/autoimmune deficiency, stroke and diarrheal disease (WHO, 2015). Although cardiovascular disease substantially reduces life expectancy, the most current data set from 2014 suggests that communicable diseases such as influenza and pneumonia respiratory infections remain the deadliest pathologies throughout the country (PAHO, 2014). Death rates produced by both diabetes mellitus and ischemic heart disease have drastically increased by two-fold since 2005 and is now recognized as the second and third leading cause of death in Guatemala (PAHO, 2014). Coinciding data further suggests that a significant increase of non-communicable diseases such hypertension, obesity, and tobacco use are contributing factors related to high rates rates of diabetes and ischemic heart disease (WHO, 2015). Death rates triggered by interpersonal violence of homicide, suicide, and accidental injuries remains a noteworthy issue; however, the mortality rate has plummeted and is at an all-time low since 2005

(PAHO, 2014). Finally, data suggests a direct correlation between a 15% increase in sanitation practice and a significant decline in mortality from diarrheal disease occurrence among the population between 2012 and 2015 (WHO, 2015).

Lower respiratory infections accounted for 6,738 deaths in 2014 in Guatemala; the most substantial impact despite a 30% decrease in occurrence since 2005 (PAHO, 2014). The children of Guatemala carry the vast burden of this disease. In fact, 17% of all child deaths between the ages of one and five are attributed to acute respiratory infections (WHO, 2015). Data suggests that the treatment of childhood pneumonia continues to regress as less children receive adequate care. The WHO reported that a mere 59.5% of children who had pneumonia in 2008 were taken to healthcare providers for treatment in contrast to the 64.3% who received treatment for pneumonia in 2002 (WHO, 2018d).

Healthcare System

Currently in Guatemala, the healthcare sector is separated into two divisions: the public and the private sector. The public sector consists of national hospitals which provide free care, but these facilities often lack adequate staffing and essential supplies (A. Bockstahler, personal communication, October 9, 2018). For example, a patient may wait for hours to be seen, but the hospital is without the proper medications or supplies. The patient or family member must then go buy what is needed from the pharmacy and return to the hospital. Even then, the doctor may not be well-trained, leading to poor health outcomes (A. Bockstahler, personal communication, October 2018). The private sector, on the other hand, is usually staffed with well-trained doctors and nurses and has access to a wider variety of supplies and medicines (A. Bockstahler, personal

communication, October 9, 2018). Most private clinics require payment for their services, meaning that most people cannot afford to be seen in a private hospital. Unfortunately, the private sector of healthcare in Guatemala is not government regulated; therefore, anyone can open up a hospital, causing substantially poor health outcomes (A. Bockstahler, personal communication, October 9, 2018).

Overall, the healthcare system of Guatemala has been marked by dysfunction for many years. According to the United States Agency for International Development (USAID), four main issues exist within the Guatemalan healthcare system: (1) limited access to care, (2) cessation of the Extension of Coverage Program (PEC), (3) incomplete care in rural clinics and lack of referral system, and (4) the absence of essential medical supplies and equipment (Avila et al., 2015). Each of these problems is exacerbated by an already broken and under-funded governmental system that struggles to meet the medical needs of its citizens (Avila et al., 2015).

It comes at no surprise that diminished access to care is concentrated in rural areas. While a shortage of rural healthcare workers exists, the healthcare system in rural Guatemala faces many additional obstacles. Rural areas are dominated by dense populations of indigenous people working in the informal sector (Avila et al., 2015). Each indigenous group may speak the same native language; however, varying dialects make each language unique (PAHO, 2015a). Healthcare providers in Guatemala often face language barriers despite being fluent in Spanish, the national language. Therefore, even if a clinic in a rural area exists, indigenous people are marginalized by an absence of providers speaking in their own language (Avila et al., 2015).

Guatemala is also plagued with an extreme shortage of healthcare workers. According to USAID, urban areas have 25.6 health care workers per 10,000 citizens (Avila et al., 2015). Comparatively, rural areas have 3 healthcare workers per 10,000 citizens (Avila et al., 2015). This problem is caused by temporary hiring systems, high rates of staff turnover, corruption within the hiring system, and high drop-out rates among those in school for healthcare related occupations (Avila et al., 2015). The USAID recommends 2.8 nurses per physician; however, Guatemala has only 0.66 nurses per physician (Avila et al., 2015). This not only decreases access to care, but vastly limits the amount of impact one doctor can have in Guatemala.

The second reason that healthcare in Guatemala is struggling to meet the needs of its people is the recent termination of the PEC. As legislated by the Constitution of 1985, universal healthcare for all Guatemalans is a requirement by the government (Avila et al., 2015). In order to carry out this vision, in 1997, arrangements were made with many non-governmental organizations (NGOs) in Guatemala to provide primary healthcare to those in need, namely those living in rural areas (Avila et al., 2015). This was the creation of the Extension of Coverage Program (Programa de Extension de Cobertura, [PEC]) (Avila et al., 2015). Over the first two years, the program thrived and expanded, extending care to 3.5 million people and helping to provide care to 76.8% of the population that was previously uncared for (Avila et al., 2015). By 2012, the program had grown to provide care for 4.3 million Guatemalans (Avila et al., 2015).

Unfortunately, the PEC was not always supported or nurtured by every governmental administration; therefore, the PEC was "highly dependent on the whims of the current administration" (Llanque, 2015, p. 7). As a result of this lack of support, the

PEC experienced shortages in the supplies and finances needed to succeed. The USAID points out that government-appointed leaders of the Ministry of Health and Social Assistance (MSPAS), the department that oversaw the PEC, are often under-qualified, highly rotated, and have different goals for healthcare in Guatemala (Avila et al., 2015). For several reasons, those receiving and providing care in Guatemala were not pleased with the PEC. Displeased individuals thought that the PEC was discriminatory against those it served because the quality of care was less than what was provided by MSPAS Level 1 centers (Avila et al., 2015). In a paper exploring the PEC and its successes and shortcomings, the author stated that NGO staff often complained of unfair fines for minor paperwork discrepancies instead of being recognized for providing quality care or meeting healthcare goals (Llanque, 2015). Another characteristic of the PEC program that caused misalignment in values and goals of the MSPAS and NGOs was where their focuses were placed. While MSPAS was concerned with bureaucracy and paperwork, the NGOs desired to focus more on the development and engagement of the community (Llanque, 2015).

Opposition to the PEC continued to grow and by 2013 the Legislative Decree 13-2013 was passed (Llanque, 2015). This law "prohibited the State from outsourcing the delivery of [healthcare] services to nonprofit organizations, international organizations, or associations" (Avila et al., 2015, p. 21). This law was originally put in place as the start to a three-year phase-out of the PEC; however, in 2014 a decision was made to cut off all financial support to NGOs as well as terminate any existing contracts for PEC-related services (Avila et al., 2015).

As a result of the end of the PEC many rural Guatemalans were immediately left without access to healthcare of any kind (Avila et al., 2015). Childhood immunizations rates were one of the areas most devastated (Llanque, 2015). Within the first few months, the immunization rate dropped below herd immunity, something that the PEC had worked so hard to achieve (Llanque, 2015). Clinics also lost their access to oxytocin, which not only lead to their inability to perform high-quality deliveries, but also left them without means to treat the number one cause of maternal death in Guatemala, postpartum hemorrhage (Llanque, 2015).

Although Guatemala boasts the largest economy in Central America, the government has often struggled to adequately finance its entities, namely healthcare. As a result, healthcare in Guatemala suffers due to a lack of medical resources and supplies. Guatemala spends the least amount of their governmental resources per capita on health than any other country in the region (Avila et al., 2015). In 2015, the Guatemalan government spend $176 PPP per capita on healthcare, while surrounding countries spent $436 PPP (Avila et al., 2015). For some perspective, in 2015 the United States spent roughly $9500 PPP per capita on healthcare (Organization for Economic Co-operation and Development, 2017). Unfortunately, governmental corruption and lack of financial management has led to inefficiency at all levels (Avila et al., 2015). The USAID has "legitimate concerns about the health sector's ability to account for how funds are spent", leading to public opposition against increased funding of healthcare (Avila et al., 2015, p. 7). The healthcare budget is often 40% below what is requested leading to an inadequate supply of medicine and other vital medical supplies (Avila et al., 2015).

Lack of access to healthcare in both rural and urban areas results in reduced implementation of preventative care measures including birth control, health screenings, and general health education (Avila et al., 2015). Of the few that do seek preventative care, the majority are from the private sector (Avila et al., 2015). This is because of the quality of care generally provided in these facilities as well as the ownership of health that accompanies having to pay for the healthcare you receive. As noncommunicable disease, maternal death rates, and infectious disease rates are at incredibly high levels in Guatemala, healthcare providers must begin to integrate preventative medicine into practice, especially in the private sector (Avila et al., 2015).

Diabetes

Overview.

Diabetes mellitus is a chronic disease in which the body's ability to respond to or produce insulin is affected, resulting in an elevated blood glucose level. Diabetes, when diagnosed, is defined as a fasting plasma glucose of 7.0mmol/l (126mg/dl) or greater (WHO, 2012b). Two different types of diabetes exist: diabetes types 1 and 2. Type 1 diabetes is much less prevalent, accounting for less than 10% of all cases. This diabetes is due to insulin deficiency, and it typically manifests early in life (Dagogo-Jack, 2006). Alternately, T2DM is a condition that occurs when the body is unable to process and utilize the insulin that it produces. Thus, T2DM is not due to insulin deficiency, but ineffective utilization of the insulin in the body (WHO, 2016). Type 2 diabetes mellitus accounts for the vast majority of diabetes cases (>90%), making this disease the primary contributor to the worldwide diabetes epidemic (Dagogo-Jack, 2006).

According to the WHO, approximately 422 million adults were living with diabetes worldwide in 2014, quadrupling the rate over the last four decades. The prevalence is increasing most rapidly in low and middle income countries (WHO, 2016). In fact, 80% of diabetics live in countries labeled low income or middle income (Chary, Grenier, Bowers, & Rohloff, 2012). Globally, diabetes accounted for $376 billion in health expenditures, 12% of total health expenditures, in 2010 (Hu, 2011). An estimated $490 billion will be spent on diabetes in 2030 if current trends in diabetes rates continue. The significant cost is a large threat to developing countries, as financial burdens of this capacity are capable of depleting a developing country's economy (Hu, 2011).

According to Hu (2011), T2DM was previously found primarily in developed countries, but it has since expanded to affect every country in the world. Additionally, T2DM was formerly seen in only adult populations, but the average age continues to decrease over time, now including pediatric populations (Hu, 2011). Records confirm increasing prevalence of T2DM in all countries worldwide, but this increased rate is most drastic in developing countries (Flood et al., 2016). Projectional studies estimate that T2DM cases from 1995-2025 will increase by 42% in developed countries (51 million to 72 million cases), while increasing by 170% in developing countries (84 million to 228 million cases) (Dagogo-Jack, 2006).

The typical individual with T2DM in developing countries differs from that in developed countries. In developed countries, men are affected more than women, and peak age at the time of diagnosis is over 65 years. However, in developing countries, the gender prevalence is reversed, as women are more commonly inflicted. Additionally,

peak age at diagnosis for T2DM in developing countries is 45-64 years (Misra, Singhal, & Khurana, 2010). Due to the fact that individuals in developing countries acquire T2DM at a much younger age, this is predicted to have a severe economic impact (Dagogo-Jack, 2006). As many individuals are in the middle of a working/professional career between ages 45-64 years, the increasing prevalence of diabetes in these populations will hinder the amount of work-eligible individuals, resulting in a financial detriment to that economy (Dagogo-Jack, 2006).

In Guatemala, diabetes is currently the fourth leading cause of death (Bream, et al., 2018). A study conducted in 2012 estimated Guatemala City to have an overall diabetic prevalence of 8.4% (Chary, Grenier, Bowers, & Rohloff, 2012). Another study estimated pre-diabetes rates in Guatemala City to be approximately 28.2%, suggesting that diabetes will be of epidemic proportion in Guatemala in the near future if interventions fail to take place (Bream, et al., 2018).

Risk Factors.

Worldwide, diabetes prevalence is increasing due to a number of factors: population growth, urbanization, weight gain, aging, and sedentary lifestyle among others (Wild, Roglic, Green, Sicree, & King, 2004). Specifically, obesity and lack of physical activity are two major risk factors that predispose an individual to develop T2DM, as both of these risk factors have been proven to promote insulin resistance by the body (Dagogo-Jack, 2006).

Many developing countries have recently experienced economic development, westernization, and globalization, leading to a change in food and nutrition sources. New diets include higher consumption of carbohydrates, trans-fats, red meat, and fast food

options while decreasing fiber intake. Dietary shifts like this contribute to weight gain, increased obesity, and ultimately increased T2DM (Hu, 2011). Over the last three decades, Guatemalans have experienced a steady increase in mean Body Mass Index (BMI). Corresponding to the increase in BMI, the prevalence of diabetes has increased from 8.9% to 11.5% in men and 8.0% to 14.0% in women (Chary, Grenier, Bowers, & Rohloff, 2012). Various epidemiological studies have also connected decreased physical activity to higher risk of diabetes. Specifically, two hours daily of a sedentary activity translates to a 14% increased risk in acquiring diabetes (Hu, 2011).

Lack of adequate nutrition in childhood has also been shown to increase the risk of acquiring T2DM (WHO, 2016). For instance, corn tortillas are an abundant and inexpensive staple of Guatemalan diet; however, these tortillas are not highly nutritious. The families who use tortillas as a staple of their diets are predisposing their children to nutritional deficits and thus, diabetes, from a young age. Numerous Guatemalans have limited dieting options due to financial barriers and are often left eating food that lacks nutrition, increasing the risk of T2DM (Chary, Grenier, Bowers, & Rohloff, 2012).

Another risk factor for diabetes is cigarette smoking. One meta-analysis study showed that people who currently smoke have a 45% increased risk of diabetes when compared to nonsmokers (Hu, 2011). Many individuals in developing countries are everyday smokers, making them predisposed to developing diabetes. According to Barcelo, et al. (2011), a study of 1,397 adults in Guatemala City in 2011 showed a close correlation between smoking and diabetes. Of those interviewed, almost 20% reported to have smoked for many years, beginning on average at age 17. Of the smokers, 36.6%

were confirmed to have diabetes, compared to less than 8% diabetes prevalence among the non-smokers interviewed (Barcelo, et al., 2011).

Prevention.

Lifestyle and diet modifications, if implemented appropriately, have proven to be effective in preventing the majority of T2DM cases worldwide (Hu, 2011). Several large-scale studies have shown that prevention focused on increasing physical activity, decreasing caloric intake, and promoting weight loss when necessary has been more effective than pharmaceutical options in developing countries (Hu, 2011; Dagogo-Jack, 2006). Lifestyle changes are relatively low cost and able to be implemented locally, whereas preventative medications require importation and are often too expensive for the local populations. Thus, diet and lifestyle modifications are the prevention options of choice (Dagogo-Jack, 2006).

One study showed that 2 hours of light physical activity daily correlated to 12% reduction in diabetes risk. Engaging in a moderate physical activity for 1 hour daily correlated to 34% decreased risk of diabetes (Hu, 2011). The Diabetes Prevention Program (DPP) also conducted a study that focused on subjects with impaired glucose tolerance. Participants were encouraged to lose at least 7% of their body weight by eating 500-700 fewer calories per day and completing at least 150 minutes of moderate intensity activity weekly. After 2.8 years, incidence of diabetes in these individuals was reduced by 58% when compared to a placebo group. Changes to activity and diet not only prevented progression to diabetes, but it actually improved glucose tolerance in a large percentage of the subjects being studied. Results were consistent through all ages, genders, and cultural subgroups. Diabetes prevention is crucial in developing countries

especially, as most individuals are unable to afford the appropriate treatments once diagnosed (Dagogo-Jack, 2006). Thus, if these trials are translated to public health practice and clinical recommendations, diabetes can be effectively prevented, diminishing the rate of diabetes worldwide.

Barriers to care.

Many barriers exist in regard to effective diabetes treatment in Guatemala, including linguistic barriers, lack of physicians, high pharmaceutical costs, and lack of appropriate diagnostic materials. Additionally, many diabetic patients live far from a clinic, lacking appropriate means for transportation to and from appointments. Other complications include a low patient literacy rate as well as lack of ability to recognize signs and symptoms, leading to late presentation to the clinic and increase in disease related complications (Flood et al., 2016).

In a study conducted with indigenous Guatemalan diabetics, most of the interviewed individuals reported that the main barrier to effective diabetes treatment is the cost of medications, as effective treatment costs thousands of quetzales. In fact, as a single vial of insulin costs approximately 250 quetzales, which equates to 4 days salary for these individuals at legal minimum wage rates (Chary, Grenier, Bowers, & Rohloff, 2012). The high expense of medical follow up often results in patient withdrawal from care, making treatment much less effective in these individuals (Flood et al., 2016).

Medical consultations in Guatemala are similarly expensive and difficult to acquire due to lack of adequate staff, technology, and medication (Chary, Grenier, Bowers, & Rohloff, 2012). In contrast to western nations who have abundant access to physicians highly specialized in endocrinology, most low and middle income countries

lack access to even general practitioners (Esterson, Carey, Piette, Thomas, & Hawkins, 2014). Developing countries continue to lack access to pharmaceuticals including oral medications and injectable insulin. This barrier creates a substantial difficulty in treating patients effectively, leading to a higher rate of uncontrolled diabetes and complications. One study showed that the oral diabetes medication Metformin was only available in 45% of public health care facilities in low income countries. Additionally, insulin, which is available in 96% of clinics in high-income countries, is only available in 23% of clinics in low income countries (WHO, 2016).

Another barrier is the difficulty to appropriately diagnose and monitor patients with diabetes in Guatemala, as Hemoglobin A1c (HbA1c) tests are less common in Guatemala due to their high expense and unavailability in many clinics (Flood et al., 2016). In fact, over 65% of low income countries lack the basic technology required to diagnose and manage diabetes (WHO, 2016). Many individuals also struggle with finding transportation to their appointments, leading to missed appointments and lack of appropriate follow up care. Language barriers also present a large obstacle in treating diabetes. A large majority of Guatemalans with diabetes have strong preference for the Mayan/indigenous language over Spanish. This makes communication and education difficult for providers who do not speak the same language as their patients (Flood et al., 2016).

Lack of adequate health literacy is another major barrier to diabetes care in Guatemala. Many patients in developing countries are unaware of the signs and symptoms of diabetes; thus, patients are less likely to present to the clinic until later in the course of their illness, adding to the complicated nature of their diabetes (Esterson,

Carey, Piette, Thomas, & Hawkins, 2014). When Guatemalans with diabetes were questioned about the importance of dietary changes to address their disease, one study showed that 30% of respondents believed no dietary changes were necessary. Many Guatemalans were also unaware of the chronic nature of the disease or possible end-organ complications, falsely attributing the cause of their diabetes to acute stress or fear (Chary, Grenier, Bowers, & Rohloff, 2012). The benefit of insulin is not fully understood in Guatemala either, as many individuals have expressed fear towards use the drug based on a number of misconceptions (Flood et al., 2016).

Complications.

The majority of hospitals and clinics in developing countries are ill equipped in their ability to monitor a patient's HbA1c, leading to poor glycemic control and inevitably resulting in uncontrolled diabetes (Dagogo-Jack, 2006). When diabetes is uncontrolled, various complications including diabetic retinopathy, stroke, and limb amputation are likely to occur (WHO, 2016). Studies of diabetic patients in Guatemalan clinics have shown higher than average rates of poor glycemic control as well as frequent end-organ related complications (Flood et al., 2016).

Diabetes is the most common cause of lower limb amputations unrelated to trauma. Diabetics are 10 to 20 times more likely to undergo a lower extremity amputation, and the risk of a diabetic developing a foot ulcer over a lifetime is 15% (WHO, 2012b). Thus, a diabetic patient in a low resource setting should be educated on appropriate foot hygiene including nail trimming, use of shoes, and treatment of lesions and calluses (WHO, 2012b). Retinopathy from diabetes is one of the largest causes of vision loss worldwide. This complication is substantially more common in developing

countries due to infrequency of follow up care. Current worldwide recommendations state that diabetics should have their eyes checked at a minimum of every two years, but this does not happen for many diabetic patients in developing countries, leading to vision loss (WHO, 2012b). Cardiovascular disease is two to three times more likely in diabetics, and over 80% of end-stage kidney disease is attributed to diabetes and/or hypertension (WHO, 2016).

In severe situations, death can result from diabetes complications. Diabetes was the eighth leading cause of death in 2012, causing 1.5 million deaths worldwide. Additionally, 43% of all deaths related to elevated blood glucose take place before the age of 70 (WHO, 2016). Worldwide deaths due to diabetes are predicted to double in the next decade (Chary, Grenier, Bowers, & Rohloff, 2012). Furthermore, projections estimate that by the year 2020, 70% of diabetes-related deaths will be occurring in developing countries (Misra, Singhal, & Khurana, 2010). A disproportionate rate of premature mortality due to diabetes is observed in low and medium income countries, and this can be directly attributed to lack of access to appropriate treatment for diabetes after diagnosis (Flood et al., 2016).

Management.

The goal in treating diabetes is to lower plasma glucose. By lowering plasma glucose to be near or below the diagnosing criteria of 7.0mmol/l, the risk of diabetic complications, specifically microvascular and organ injury, diminishes (WHO, 2012b). Diabetes is especially difficult to treat in developing countries due to a number of factors. Medication is difficult to acquire due to its high price. If obtained, the medication needs to be stored at proper temperature, and this task is challenging for individuals in

developing countries. Home glucose monitoring is also difficult to acquire, and patient education is limited, making proper use less likely. Additionally, many clinic follow-ups are required for appropriate monitoring. With limited transportation options, a large number of individuals have difficulty returning for regular follow-up appointments (Dagogo-Jack, 2006).

Type 2 diabetics with no contraindications of renal insufficiency, liver disease, or hypoxia are typically prescribed Metformin as a first line hypoglycemic. Metformin has been shown to lower HbA1c levels by at least 1 mmol/l when compared to using dieting alone as treatment (WHO, 2012b). If a patient has a contraindication or lack of response to Metformin, sulfonylureas are recommended as an alternate first line treatment of T2DM. Compared to Metformin, sulfonylureas have a similar effect in lowering HbA1c (WHO, 2012b).

Although pharmaceuticals are effective in lowering HbA1c, the effect diminishes if medications are discontinued (WHO, 2016). Guatemalans with limited income frequently discontinue and then resume medications, dependent upon financial availability. Considering their inconsistent medication use, effective interventions for diabetes in developing countries include methods identical to the recommendations for diabetes prevention: diet and physical activity modifications. These intervention methods are both low cost and low risk to the patient, making them especially favorable in the developing world (Wild, Roglic, Green, Sicree, & King, 2004).

Other methods of effective diabetes treatment in Guatemala have included free and reduced price appointments with reimbursement for transportation expenses. Additionally, as physicians are sparse in Guatemala, native Mayan nurses have been

effectively utilized in some studied clinics to care for diabetics while addressing the language barrier. Indigenous nurses are able to spend more time educating and caring for a patient than a physician, and their schedule also promotes more frequent follow up appointments. These factors collectively lead to improvements in patient care and education (Flood et al., 2016). The results of this study show that favorable outcomes to treatment of diabetes are possible in developing countries.

Malnutrition

The magnitude of chronic malnutrition has plagued Guatemala for many years and it appears that the encumbrance will continue to linger throughout the country for many decades to come. The chronic malnutrition rate in Guatemala surpassed all South and Central American countries (World Bank, 2018). In comparison to the world, only five countries including the Republic of Yemen, Eritrea, Burundi, and Papua New Guinea possessed greater burdens of malnourishment per capita than Guatemala (World Bank, 2018). Specific to Guatemala, stunting, undernutrition, and wasting are subsets of malnourishment that disproportionately evoke large disparities among the various ethnicities, age groups, genders, and geographical populations throughout the country. Children under the age of three years old, pregnant women, indigenous populations, and the poorest citizens carried the largest burden of malnutrition (World Bank, 2018).

Throughout all disparities, young Guatemalan children carried the vast majority of the burden. Suggestive of a 2015 report, the World Health Organization asserted that nearly half of the entire child population suffered from malnourishment due to stunting and iron deficiency (WHO, 2018a). The degree of stunting seen throughout children appeared to be increasingly elevated proportional to age. Anthropometric measurements

of various children under the age of five demonstrated that nearly 48% were stunted (WHO, 2018a). Furthermore, children who were less than two years old were exposed to an astonishing 54% chance of becoming stunted (World Bank, 2018). Anemia due to iron deficiency often coexists with the aforementioned stunting when nutritional intake is inadequate. Consequently, more than one third of pregnant women were iron deficient throughout pregnancy which directly amplified deficiencies among nearly 50% of children (Directorate-General for International Cooperation and Development [European Commission], 2015).

The threat of malnutrition extends well beyond children and pregnant women due to a disparity in adequate nutritional distribution among the different wealth quintiles. The disparity is evident as nearly 66% of the poorest quintile were stunted in comparison to a lower 17% stunting rate among the wealthiest citizens (World Bank, 2018). The significant gap in disparity decreased by 5% from 2008 to 2014; however, the results were uncharacteristic. The stunting marginally receded among the poor population while the wealthiest population experienced an increase in occurrence, thus narrowing the overall stunting disparity within the wealth quintiles (World Bank, 2018).

Many resources analyze stunting in Guatemala through other significant disparities such as those among the indigenous and non-indigenous populations. The indigenous populace has maintained the vast majority of the malnourishment burden in the country. For example, in 2008, nearly 70% of all indigenous Guatemalan natives had the largest, disproportionate stunting burden (European Commission, 2015). Similarly, the number of stunted indigenous children was nearly double in quantity than stunted non-native Guatemalans (World Bank, 2018). The most recent data from 2009 suggested

that malnutrition rates have dropped by approximately 7% on average throughout the indigenous people and approximately 4% with non-indigenous citizens (World Bank, 2018).

Stunting, undernutrition, and wasting subsequent of malnourishment is directly linked to both the quality and quantity of health services, clean water through adequate infrastructure, appropriate sanitation practices, healthy pregnancy in young women, crop yield, poverty, and productivity rates. The expense of undernutrition in Guatemala is substantial costing the country more than $8 million per day in lost economic growth due to illness, long term hospitalization, decreased productivity in critical jobs, and lack of progression in primary school (European Commission, 2015).

Proper nutrition during fetal development and the first 1,000 days of birth is vital in the prevention of irreversible functional deficits later in life (WHO, 2018a). Permanent consequences of chronic malnutrition include poor cognitive and physical abilities, a degraded immune system, reduced educational achievement, low adult income, decreased productivity rates, increased risk of nutritional related disease, impaired health during pregnancy, and an increased rate of death (WHO, 2018a). Importantly, a chronically stunted child who surpasses the age of three without nutritional intervention will remain stunted throughout adulthood regardless of improved nutritional value later in life (World Bank, 2018). Furthermore, excessive feeding beyond the age of three does not compensate for previous malnutrition. Instead, over feeding contributes to obesity with no reversal of diminished growth-height standards (World Bank, 2018). The European Commission supports the aforementioned claim while advising that providing overnutrition to stunted individuals in an effort to reverse stunting ultimately leads to

obesity later in life with associated chronic diseases such as T2DM (European Commission, 2015). Consistent with the increased burdens of stunting among the indigenous population, obesity among the same indigenous women has doubled (European Commission, 2015). Although the occurrence of obesity and overweight women has doubled over the last 30 years, there has been minimal relief of burden since 2000 (WHO, 2018a).

Supporting statistics demonstrated that Guatemala's malnutrition rate can be directly linked to the country's water supply systems, sanitation practices, and personal hygiene (World Bank, 2018). Recent improvements in sanitation and water infrastructures, although minimal, have had a positive impact on stunting. Accordingly, the increased use of toilets and the use of improved water infrastructures has significantly decreased diarrheal disease and poor gastrointestinal absorption (World Bank, 2018). In fact, the greatest combined factor contributing towards a decrease in malnutrition is through improved healthcare access coupled with increased sanitation methods (World Bank, 2018). Unfortunately, additional progress is stifled as only 56% of younger children received oral rehydration therapy during severe bouts of diarrhea to prevent additional malnourishment (WHO, 2018a).

The Guatemalan government established new policy to minimize malnourishment by 10% under the leverage of the 2012 Zero Hunger Pact and the World Health Assembly's established 2025 goals (European Commission, 2015). The standing 2012 Hunger Pact provides government oversight and accountability on funding, food securities, nutrition distribution, and improved healthcare. Despite a robust economy by regional standards, the Guatemalan government recognizes that its progress is not on

pace with eradicating hunger within the near future. At the current progression rate of 1% improvement per year, the European Commission suggests that it will take the Guatemalan government more than 40 years to eliminate stunting within the confines of their country (European Commission, 2015). Accordingly, the European Union has established three strategic priorities aimed at improving nutrition throughout the region through a variety of supporting methods. Specific objectives include: fostering political commitment, focusing on nutritional deficiencies for children within their first 1,000 days of life, increasing and prioritizing health coverage for postpartum women and children, and boosting small scale farming in indigenous populations with financial support of 21 million euro (European Commission, 2015). Additionally, these strategies include the development of policy to support strength through knowledge, establish remedies, modify resource allocation, and continued assessments (European Commission, 2015).

Sanitation

Currently ranking as the second poorest country in Latin America with poverty rates that are continually rising, Guatemala is plagued with national challenges in regards to sanitation and access to water (World Bank, 2018). In 1990, the United Nations established Millennium Development Goals (MDGs), and for over 30 years Guatemala has been working to improve both sanitation and access to water for their people (WHO, 2018e). The MDGs define access to water as having a water source that is accessible within a 30-minute round trip (World Bank, 2018). When MDGs were created, 77% of the Guatemalan population had access to improved water while 31% had access to improved sanitation (World Bank, 2018). The 2015 target goal of 88.5% for improved water usage was exceeded and reached 91% by 2014; however, the target goal for access

to improved sanitation was not met (World Bank, 2018). Just 53% of the population had achieved access to improved sanitation by 2014, which was 12.5% short of the target goal (World Bank, 2018). The sanitation goal was not met and lags considerably behind access to improved water largely because of rural sectors in Guatemala. In 2015, a new set of goals, called the Sustainable Development Goals (SDGs), were created to establish new benchmarks for access to improved water and sanitation facilities (World Bank, 2018). In order to achieve the new SDGs, Guatemala must emphasize how essential access to improved sanitation and drinking water is for the health of its people. By doing so, Guatemala will overcome many national health burdens that currently weigh heavy on their country.

While the percentage of the Guatemalan population with access to improved drinking water increased to 87% within 10 years of MDGs, it only grew another 4% over the next 14 years (World Bank, 2018). Guatemalan citizens who are considered extremely impoverished have the least access to improved drinking water at 85% (World Bank, 2018). However, access to improved water resources for these impoverished populations actually rose close to 12% from 2000 to 2014 when others' access to improved water nearly remained at a standstill (World Bank, 2018). A majority of the Guatemalan population (75%) has their water piped directly to their house; however, this number has remained stagnant since 2006 and rural populations (61%) are lagging far behind their urban counterparts (88%) (World Bank, 2018). Out of Guatemala's 22 departments, 12 are below the average of 75% with piped water to their household (World Bank, 2018). Similarly, 12/22 departments also exceed national averages in terms of a shared water source and the use of surface water (World Bank, 2018). The

lack of piped drinking water to rural households is one of the main reasons that three out of Guatemala's five most rural departments were below the MDGs in 2014 (World Bank, 2018). While Guatemala fell short of achieving improved water MDGs throughout all of its departments, substantial gains were nonetheless made as seven out of the ten most impoverished departments improved their access to water by at least 10% (World Bank, 2018). Additionally, Guatemala has the freshwater resources to exceed the demand of improved drinking water for its people (World Bank, 2018). If Guatemala is able to utilize its resources effectively and emphasizes increased access to improved drinking water for impoverished and rural populations, Guatemala could surpass SDGs by 2030 (World Bank, 2018). Sanitation, on the other hand, is much further out of reach and will require a greater amount of work.

Access to improved sanitation has increased from 39% in 2000 to 53% in 2014; however, almost half of the population continues to lack access (World Bank, 2018). Guatemala fell considerably short of the MDG for sanitation, which was 65.5% (World Bank, 2018). Furthermore, nine of Guatemala's 22 departments fall below the national average of access to sanitation (World Bank, 2018). Of those with improved access to sanitation, 38% use a toilet or facility that flushes to a sewer (World Bank, 2018). Those without access to improved sanitation commonly use latrines (41%) and defecate outdoors (5%) (World Bank, 2018). Improvements in sanitation have decreased the prevalence of outdoor defecation and latrine usage in most departments; however, outdoor defecation continues to be rampant and is as high as 30.4% in the Chiquimula department (World Bank, 2018). Inadequate access to sanitary facilities is largely due to the remote locations and financial disparities that rural populations face. As of 2014,

urban access to sanitation was three times greater than rural access with percentages of 81% and 26%, respectively (World Bank, 2018). According to World Bank, the 55% gap between urban and rural access to sanitary facilities only decreased 5% from 2006 to 2014 (Figure 1) (2018). Impoverished populations also lack considerable sanitation resources. While extremely poor citizens saw their sanitation coverage rise from 4% in 2000 to 19% in 2014, this is still four times less than non-poor citizens (80%) (World Bank, 2018). As a result, these impoverished individuals likely make up the 2% of open defecation in urban settings (Figure 1) (World Bank, 2018). While this statistic is small, the risk of disease transmission in cities is much greater due to the population density and lack of sanitation facilities to wash hands among the poorest quarter of citizens (World Bank, 2018). Just 48% of the poorest 25% of Guatemala meet the SDGs hygiene standards in comparison to 85% of the overall population (World Bank, 2018). Guatemala's sub-par sanitation and hygiene resources are a primary contributor to the widespread preventable diseases that the country struggles to manage.

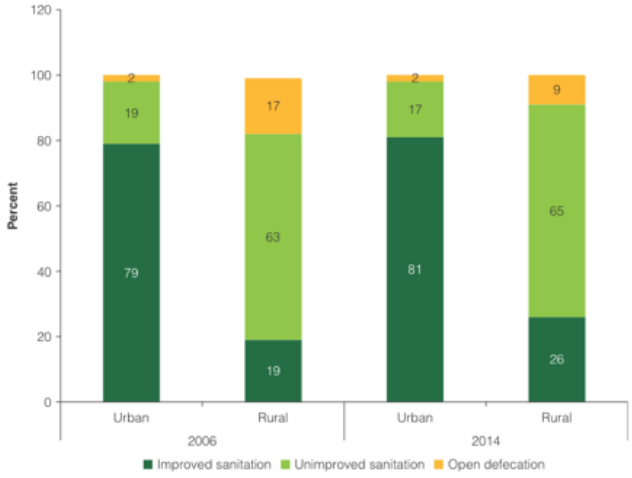


Figure 1. Sanitation Disparity of Rural Guatemala (World Bank, 2018)

The lack of access to improved water and sanitation, specifically in rural and impoverished populations, are significant contributors to diarrheal diseases in Guatemala (World Bank, 2018). Specifically regarding childhood mortality, diarrheal diseases are the second leading cause of death at 18% behind upper respiratory infections (World

Bank, 2018). Furthermore, a study in 2014 revealed that 1 out of every 5 Guatemalan parents who were surveyed reported that their child had a diarrheal incident in the past month (World Bank, 2018). The likelihood of diarrhea is directly linked to household sanitation and water supply (World Bank, 2018). More specifically, communal piped water, barreled water, and truck water all demonstrated increased incidence of diarrheal disease (World Bank, 2018). An international health study revealed that improved hygiene with hand washing accessibility considerably decreases the incidence of both diarrheal diseases and upper respiratory infections (Rabie and Curtis, 2006). Therefore, access to water for hand washing is also a prerequisite for diminishing diarrheal diseases. In order to reign in the transmission of preventable diseases and achieve SDGs by 2030, Guatemala will need to invest in improved sanitation facilities and access to water, specifically for its impoverished and rural citizens.

Conclusion

Guatemala's difficult history and shortcomings in the governmental healthcare system have crippled the nation's ability to cope with communicable and noncommunicable disease. With limited treatment options due to vast poverty, Guatemalans must prioritize preventative health to ensure the best patient outcomes. By addressing malnutrition issues, children will not only avoid growth stunting, but their immune systems will also be better equipped to fight communicable disease (WHO, 2018a). Adults receiving proper nutrition will have a better chance to avoid obesity and diabetes, two major causes of morbidity in Guatemala (Dagogo-Jack, 2006; European Commission, 2015). Providing education on sanitation will help lower rates of diarrheal and communicable disease in children and adults (Rabie and Curtis, 2006). Due to a

shortage in healthcare staff and medical resources in Guatemala, some clinics are unable to spend adequate time on preventative care (Avila et al., 2015). Guatemalans would greatly benefit from increased access to preventative education on malnutrition, diabetes, and sanitation. A detailed description of the research and methods of creating and distributing this information will be provided in Chapter 3.

Chapter 3: Methods

Introduction

Type 2 diabetes mellitus (T2DM), sanitation related disease, and malnutrition collectively comprise a large portion of the health burden in Guatemala (Bream et al., 2018; World Bank, 2018). Consequently, morbidity and mortality have both increased in Guatemala, despite the fact that the aforementioned conditions are all largely preventable with appropriate education and lifestyle modification. Literature shows that education on diet and exercise modifications correlate to lower rates of T2DM (Dagogo-Jack, 2006). Knowledge on appropriate nutrition similarly correlates to decreased prevalence of malnutrition related illnesses and growth stunting, while access to hygienic facilities and education on sanitation greatly reduce the prevalence of sanitation related disease (World Bank, 2018). The needs assessment of Corazon de Amor Health Clinic in Guatemala City was concurrent with the literature review, expressing a need for educational materials to encompass the topics of T2DM, malnutrition, and sanitation related disease.

A PowerPoint presentation regarding diabetes education was created and provided to patients of the clinic who were previously diagnosed with T2DM. An educational binder encompassing the initial diagnosis of diabetes was also provided to the clinic, and was used to educate newly diagnosed T2DM patients on the disease. Posters with information regarding malnutrition and sanitation/hygiene were created and provided to the clinic to display in the waiting area. The materials were created to address many of the preventable conditions that are commonly seen at Corazon de Amor Health Clinic. Chapter 3 describes the purpose for choosing certain resources to educate the target

population, the project plan, and implementation strategies for Corazon de Amor Health Clinic. Potential barriers to the project are also addressed.

Population

The Corazon de Amor Health Clinic is a field partner with an organization out of Joplin, Missouri called Life of Hope Ministries. Life of Hope Ministries desires to bring aid to those suffering from poverty in Latin America by providing holistically for the needs of each population (Life of Hope Ministries, 2019). In order to carry out this goal, Life of Hope Ministries has partnered with several field partners in Guatemala, such as Saul and Layla Perez, who run both a church and clinic in an impoverished community in Zone 3 of Guatemala City. Doctor Layla, along with a staff of both Guatemalans and an American missionary nurse, provide medical and spiritual care to those living in and around the large garbage dump in the heart of Guatemala City. Patients seen on a day to day basis at the clinic earn a living by scavenging through the garbage dump every day for recyclable items (A. Bockstahler, personal communication, October 9, 2018). This community is made up of roughly 10,000 individuals of all ages (A. Bockstahler, personal communication, October 9, 2018).

In order for the project to serve this specific population, a needs assessment was completed by the clinic staff. The completed assessment identified many needs including education on diabetes, nutrition, hand washing, and water purification techniques (A. Bockstahler, personal communication, October 9, 2018).

All materials created to address these needs were designed specifically for the patients that seek medical care at Corazon de Amor Health Clinic. Those who received diabetes education were patients who voluntarily chose to be a part of a six-hour diabetes

education course over the span of three days. All other materials including those covering nutrition and sanitation are available to all patients of the clinic in the form of posters. The information provided to Corazon de Amor Health Clinic was not withheld from an individual seeking healthcare at this clinic. After initial distribution of education created by this project, all materials were left to be further utilized at the discretion of the clinic staff.

Rationale for Design

The specific patient population at Corazon de Amor in Guatemala City's Zone 3 is not spared from sharing the same medical burdens as the rest of the country. Many organizations from across the world descend upon Guatemala with the goal of fulfilling the basic needs of the communities in which they serve. Amie Bockstahler is an American nurse who has been serving the patient population surrounding the Corazon de Amor Health Clinic for more than three years. Through experience and evidence-based knowledge, she identified the needs of the population and provided the rationale for this community service project. Amie emphasized that many of their patients who have already developed T2DM received minimal or no education on the prevention of the disease (A. Bockstahler, personal communication, January 9, 2019). Additional correspondence from Amie suggested the need for recurring education on the management of diabetes for those who struggle daily with the disease. As a result, the clinic's desire is to target the pre-diabetic and diabetic populations with an education and prevention program beginning in the spring of 2019 (A. Bockstahler, personal communication, January 9, 2019).

Amie additionally highlighted the need for support in educating patients on nutritional requirements. Although local food markets have a variety of healthy options, many individuals fail to select these options due to a lack of nutritional education (A. Bockstahler, personal communication, January 9, 2019). While a portion of the clinic's patient population cannot afford adequate amounts of food, a large population does have the means to purchase nutritious foods but do not take advantage of the access (A. Bockstahler, personal communication, January 9, 2019). Raising nutritional awareness to emphasize the importance of a healthy diet, portion sizes, and where to find nutrients is essential to the patient population.

As a result of widespread poverty, Zone 3 is also plagued with inadequate sanitation practices. Amie asserted that sanitation facilities are minimal around the landfill as the populous utilizes communal showers and restrooms in which payment is required for use (A. Bockstahler, personal communication, January 9, 2019). Corazon de Amor Health Clinic wishes to promote proper hand-washing and general hygiene practices through the education of all encountered patients (A. Bockstahler, personal communication, January 9, 2019).

This community service project focused on diabetes education and prevention, nutritional education, and sanitation awareness among the Corazon de Amor Health Clinic patient population. As a direct result of a dedicated partnership with the health clinic and the implementation of educational resources, this community service project aimed to leave an enduring and positive impact on the community for many years to come.

Project Plan and Implementation

The extent of T2DM prevalence, malnutrition, and sanitation shortcomings demonstrated in the literature review identifies a need for change in Guatemala. Each department and individual community in Guatemala have unique needs; therefore, Amie and the Corazon De Amor Health Clinic provided a needs assessment specific to the patient population at the clinic (A. Bockstahler, personal communication, January 9, 2019). The clinic staff is working towards a sustainable solution for their 100+ diabetic patients (A. Bockstahler, personal communication, January 9, 2019). Of these 100+ diabetic patients, an estimated 50% are open minded to lifestyle changes that could halt the progression of their diabetes and prevent less favorable outcomes (A. Bockstahler, personal communication, January 9, 2019). Additionally, the clinic staff desired that educational materials regarding T2DM, malnutrition, and sanitation be available to patients in the waiting room; however, they lack the time and financial resources to create these (A. Bockstahler, personal communication, January 9, 2019). Education about T2DM was implemented by offering voluntary classes for current diabetic patients receiving care from the clinic. Malnutrition, water purification, and hygiene was addressed by printing educational posters that were displayed in the clinic's waiting room.

In order to address the T2DM patients at the Corazon De Amor Health Clinic, an educational course was created. The core outline and educational materials for this course on T2DM was obtained from the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDKD) (National Institute of Diabetes and Digestive and Kidney Diseases [NIDDKD], 2016). The materials were presented in PowerPoint format and

were complemented with small group breakout sessions and a patient testimonial video. The course curriculum was taken from a patient education manual distributed by the NIDDKD that was given to the clinic along with the PowerPoint. By providing the educational T2DM course materials to the Corazon De Amor Health Clinic, this intervention was both sustainable and reproducible.

In order to help the clinic properly educate their newly diagnosed diabetics, a condensed educational binder was created. In the future, this binder will be utilized when a patient receives the initial diagnosis of T2DM or when a patient is identified as being prediabetic. The binder includes a very basic understanding of the disease, as well as a brief overview of symptoms, risk factors, and complications. A heavy focus on lifestyle modifications is outlined in this resource as a means of teaching the patient how to control the disease in the early stages. Providing this practical information helps T2DM patients avoid serious complications in the future.

Malnutrition was previously defined as having three possible conditions: undernutrition, stunting, or being underweight (WHO, 2018b). The malnourished patients typically seen at the Corazon De Amor Health Clinic were described as being malnourished due to undernutrition, which results from a lack of knowledge regarding the nutrients needed for healthy growth (A. Bockstahler, personal communication, January 9, 2019). To address this challenge, an educational poster displaying plate portions, food groups, and recommended daily exercise from the United States Department of Agriculture was displayed in the waiting room. A separate poster outlining proper child development stages and needs was displayed in the early childhood stimulation room at the clinic to reinforce the importance of proper childhood nutrition.

The Corazon De Amor Health Clinic encounters patients on a regular basis who have acquired illnesses as a result of not knowing when to wash their hands or how to purify water (A. Bockstahler, personal communication, January 9, 2019). Patients were able to learn about water-borne and acquired illness prevention through posters that were provided and displayed within the clinic. The educational materials illustrate realistic solutions for the prevention of illnesses so patients can implement them into their households and daily routines. Two posters illustrate both the proper technique and appropriate times for hand washing. Another poster outlines a simple technique for purifying water by placing it in sunlight. Each of these posters was openly displayed in the waiting room for patients to read while waiting to see the doctor.

Before implementing these educational resources at the Corazon De Amor Health Clinic, the subsequent ethical implications were taken into consideration. Cultural competence was incorporated by providing a patient testimonial video from the perspective of a Latin American. A culturally relevant perspective was intentionally utilized in order to maximize the relatability and effectiveness of the educational materials. Additionally, educational resources were provided in both English and Spanish to cater to the linguistic needs of both the clinic patients and staff.

The second ethical implication considered was respect for the intelligence of the patients participating in the T2DM course. Many of the T2DM patients understand that they have the disease but do not understand the cause or implications associated with diabetes (A. Bockstahler, personal communication, January 9, 2019). Therefore, the course structure was designed to begin with an elementary introduction to T2DM and

progress at a level that was appropriate for the Corazon De Amor Health Clinic T2DM patients.

The last ethical consideration addressed beneficence through educational posters placed in the waiting room. A variety of affordable and realistic methods of water purification are available online; however, without proper instruction some of these techniques could harm the patients utilizing them. Therefore, a more rudimentary technique with minimal risk requiring clear plastic water bottles and natural sunlight was provided.

Project Tools

Several educational materials were created in order to meet the needs of Corazon de Amor Health Clinic. All of the materials were either written in Spanish or translated to Spanish then proofread by Amie Bockstahler. The material was also approved by Amie to be a helpful and understandable resource for the target population.

An all-inclusive manual titled *Diabetes – Patient Education Binder* (Appendix A) was printed and used as the primary source of up-to-date diabetes education material for the medical staff at the Corazon de Amor Health Clinic. The educational binder was implemented as a primary, sustainable source of diabetes information from which educators at the clinic can reference in the future for patient education. All information, both English and Spanish translations, was obtained from the NIDDKD (NIDDKD, 2016). To properly organize the large binder, a table of contents was developed along with 24 tabbed and divided sections. The binder contains detailed information including the definition of diabetes, risk factors, preventative measures, tests, diagnosis, management, and associated complications of T2DM.

A presentation titled *Diabetes Training PowerPoint Presentation* (Appendix B) was created to educate the diabetic patients of Corazon de Amor Health Clinic during informational sessions. The presentation was used to provide a basic understanding of diabetes and helpful tips for disease management. All information in the presentation originated from the *Diabetes – Patient Education Binder* (Appendix A). The content and translation of the PowerPoint presentation was approved by Amie Bockstahler.

A testimonial video titled *Diabetes: A Sweet Story* (Appendix C) was used to supplement the PowerPoint presentation. The video consists of three parts describing diabetes, lifestyle changes, and encountered challenges. The video is retrievable from YouTube, presented in Spanish, and supplemented with English subtitles (Domeyko, 2012). Amie Bockstahler viewed and approved the video for use. The video was used at the end of each educational session to supplement the information in a relatable way.

Two identical condensed educational binders titled *Initial Diabetes Diagnosis Education* (Appendix D) were assembled using information from the *Diabetes – Patient Education Binder* (Appendix A) (NIDDKD, 2016). The binders served to educate newly diagnosed diabetics and prediabetics during their clinic visit. The contents outlined the disease process, risk factors, and potential complications of T2DM. In this resource, the focus was placed on lifestyle modifications. Ideally, the staff at the clinic will utilize this practical resource when diagnosing a patient with diabetes for the first time to establish a baseline understanding of T2DM.

A series of posters outlining proper nutrition and child development were retrieved from various sources and displayed in the waiting room of the Corazon de Amor Health Clinic. A poster titled *MiPlato* (Appendix E) illustrates proper nutrition and portion size

(United States Department of Agriculture, n.d.). Another poster titled *Etapas del Dessarrollo* (Appendix F) outlines the stages of development for a healthy child, as well as what is needed for continued proper development (International Childhood Resource Institute, 2018a). The posters are a colorful, interesting, and educational tool that can be viewed by patients as they spend hours in the waiting room.

Two posters outlining hand washing practices were also displayed near hand washing stations. The first, titled *¡Lavese Las Manos!* (Appendix G), describes an effective technique for hand washing (University of Nebraska-Lincoln, 2018). The second, titled *Cuando Lavarse Las Manos?* (Appendix H), illustrates appropriate times for hand washing (International Childhood Resource Institute, 2018b). To address water purification, a poster titled *Evite: Enfermedades del Agua* (Appendix I) outlines a practical way to ensure drinking water is purified by placing bottles of water in the hot sun (PAHO, n.d.). These posters were used as supplemental materials for providers to refer to when giving education on disease prevention.

All produced materials were left with the staff of the clinic to be used as often as needed. These materials were intended to increase the amount of education given at the clinic as well as decrease the time it takes the staff to create materials and provide quality education. Creating a simpler way to give and receive education will ideally decrease the number of uncontrolled diabetics, new diabetic diagnoses, and communicable illnesses.

Potential Barriers to the Project

The language barrier presented a significant challenge as the process of translating medically related educational material from English into Spanish was arduous and time consuming. Translation of material also presented countless opportunities for

misinterpretation, and it was possible that the original information was falsely translated in a way it was not intended. In order to minimize any translation error, Amie Bockstahler proofread and approved the Spanish material.

The differences between American and Guatemalan cultures presented another potentially limiting factor. Although an assessment with the Corazon de Amor Health Clinic was completed to determine the health needs of this population, cultural differences were also considered. For instance, Guatemalan diet has consisted heavily of rice, beans, and corn tortillas for many years (Chary, Grenier, Bower, & Rohloff, 2012). Guidelines for preventing T2DM and malnutrition recommend less of these aforementioned foods; however, minimizing consumption of rice, beans and corn tortillas is difficult for many Guatemalans. Additionally, perception of health and wellness in Guatemala varies significantly from American norms; furthermore, suggested treatments could be considered impossible or even sacrilegious to the target population. This project could have been perceived by the Guatemalan patient population as inadequate or impractical; however, appropriate measures were taken to ensure that the presented education was relevant and respectful.

Another potential limitation to this project was the effective implementation of recommended diet and lifestyle changes to improve patient health. Creating sustainable change in the population of Corazon de Amor Health Clinic relies heavily on patient adherence to medical recommendations. Thus, the long-term effects of the project will depend on both the staff and patients of the clinic as the effective implementation of the project remains variable.

Conclusion

After completing a literature analysis and corresponding with Corazon de Amor Health Clinic to discuss their needs, various educational materials were ultimately created to address T2DM, sanitation related disease, and malnutrition in Guatemala. The educational materials were designed to address the population receiving care for T2DM from Corazon de Amor Health Clinic while also presenting general health information for all patients in the waiting room. Chapter 4 details the outcomes of the material distribution.

Chapter 4: Discussion

Introduction

This discussion will highlight the results of type 2 diabetes mellitus (T2DM), malnutrition, and sanitation interventions. An emphasis will be placed on the T2DM education course and how it impacted patients at the Corazon de Amor Health Clinic. Furthermore, the discussion will identify limitations of T2DM, malnutrition, and sanitation interventions and suggest ideas for future projects aimed at continuing T2DM education at the Corazon de Amor Health Clinic and in Guatemala City. This community service project was the creation of the educational materials; however, the researchers traveled to Guatemala to implement the materials at Corazon de Amor Health Clinic without association to the Bethel University Physician Assistant program.

Summary of Results

Problem statement.

Type 2 diabetes mellitus is a worldwide epidemic that is the fourth leading cause of death in Guatemala (Bream, et al., 2018). This is largely due to a lack of resources detailing preventative measures. Knowledge deficiencies surrounding malnutrition, sanitation, and water resources lead to numerous preventable diseases and poor health outcomes throughout Guatemala. Applying research findings to create preventative education materials for T2DM, malnutrition, and sanitation will improve the quality of care at the Corazon de Amor Health Clinic in Guatemala.

Purpose.

Corazon de Amor Health Clinic often sees more than 200 patients per day, many of which suffer from malnutrition, communicable disease, waterborne diarrheal disease,

and diabetes. As a direct result of a lack of funding, time, and staff coupled with an overwhelming number of patients to care for, the clinic offers only limited resources for treating each of these ailments. Many of the patients treated at the clinic also lack the basic resources needed to care for themselves at home. For this reason, it was determined that the best way to meet the needs of Corazon de Amor Health Clinic's patients was to prevent the disease with quality education, to stop it before it even began. While this method may be slow to start, it will help save time, money, resources, and lives long term.

Approaching the solution to these health disparities from a preventative perspective was solidified by the research team's findings upon arrival to the clinic. For example, a student from the diabetes training session explicitly verbalized with the aid of a translator that many of the students in the class had not previously been told any of the information on diabetes that was presented (refer to Appendix B). This was confirmed by many other students in the class. Another student admitted that her blood glucose reading had been 350 mg/dL the day before and her new goal was to have it under 150 mg/dL. Hearing firsthand testimonies confirmed what the research team had already assumed to be true: many diabetic patients receiving care at Corazon de Amor Health Clinic lack the basic education needed to care for their disease in an effective way. Diabetes is a multifaceted illness that requires a detailed knowledge of the disease process, symptoms, complications, and lifestyle changes needed to manage it properly; however, the clinic staff does not have adequate time to address this important need within their large diabetic patient population. The research team was only intimately involved with a small portion of those who currently suffer from diabetes and seek care

from the clinic. Conditions such as malnutrition, diarrheal disease, and other communicable disease also plague this community. Posters were created to address these needs. Communications with the clinic staff revealed a great need for preventative education to help combat diabetes, sanitation, and malnutrition in a way that is cost effective and does not deplete the already limited resources at the clinic.

The research team was also encouraged by the enthusiasm many students of the diabetes training shared about being advocates for their communities. Educational posters addressing malnutrition and sanitation were also created; however, because of the passive nature of these materials, it is difficult to assess their efficacy at this time. As stated above, implementing preventative education can be slow to show results; however, if those who receive the education are willing to share what they have learned with their communities, benefits may be realized sooner than expected. All of these findings reinforced the project's aim to address Guatemala's high disease rates with prevention education.

Implementation.

The project was implemented using different techniques for each subgroup addressed. Education on proper nutrition, growth standards, water sanitation, and hand washing was provided on a series of six posters hung throughout high traffic areas in the clinic (Appendices E-I). The posters provide a sustainable source of education on the prevention of malnutrition, growth stunting, and communicable disease for the patients and staff of Corazon de Amor Health Clinic.

A binder to educate the clinic's newly diagnosed diabetic patients was created to help bridge the gap between diagnosis and attending a diabetes training session. These

small binders give a condensed, but thorough overview of diabetes and effective management practices that can be utilized after a patient's initial diagnosis (Appendix D). Providers who are making a first-time diabetes diagnosis can use these binders as a resource for brief, initial education. These binders are not to be used as the only source of information, but as a supplement to education given by the provider as well as to give the patient a few ideas on how to manage their disease while waiting to attend a more expanded diabetes training session.

Lastly, a combination of many different mediums was used to produce a three-day diabetes training session for those previously diagnosed with diabetes at Corazon de Amor Health Clinic. These materials included a training PowerPoint (Appendix B), a video testimonial (Appendix C), a comprehensive binder of diabetes education (Appendix A), and two Guatemalan translators. The training was given over a series of three days for two hours a day. There was a morning (9-11am) and an afternoon (2-4pm) session containing an average of 10 patients each.

Day one began with an introduction to the researchers and goals for the training. Next, the students were interviewed individually by the researchers using the cross-cultural medicine tool described in Appendix B. The researchers used this information to gauge the preexisting knowledge the group had on diabetes while gaining a better understanding of how Guatemalan culture affects T2DM patients at the Corazon de Amor Health Clinic. Next, an overview of diabetes, its risk factors, and symptoms was presented. Following the teaching, part one of the testimonial video was played to help reinforce the information that had been presented. The day concluded with some low intensity exercises to help facilitate ideas for physical activity.

Day two focused primarily on the complications of diabetes. Discussing complications proved to be a vital aspect of the training. Many students left determined to make the changes necessary to avoid possible complications. Part two of the testimonial video was played and helped to supplement the material that was presented. Again, the day concluded with low intensity exercises to help facilitate ideas for physical activity.

The management of diabetes was covered on day three of the training. Management techniques included medication and exercise, with a heavy focus on diet. From the pre-education survey, the researchers determined that most students at the training were prescribed Metformin, with a few also taking Glipizide or injectable insulin. Therefore, these three medications were covered in depth. Information included mechanism of action of the medication as well as the side effects. Education on healthy dieting proved to be one of the most anticipated and complex portions of the entire training. By using visual aids and enlisting the help of Guatemalan translators, the researchers described a healthy diabetic diet. The diet portion began with a general outline of what foods should be chosen versus avoided and also included how to properly portion meals. Special focus was given to identifying prevalent foods in Guatemalan culture that are high in sugar and carbohydrates, including flour tortillas, black beans, sweet bread, and bananas. Lastly, education was given on the timing of meals and the importance of spreading carbohydrate choices throughout the entire day. Many students asked questions and added discussion during this section, adding to the effectiveness of the education. Exercise practices were described in greater detail during this section of the training and a longer period of low intensity exercise was completed at the end of the

session. Part three of the testimonial video was used to reinforce the information presented during the session. Lastly, a post-education group discussion was mediated by one of the researchers using the questions found in Appendix B. The discussion that ensued allowed the researchers to gauge the impact that the training had on the students while receiving feedback on what could be improved moving forward.

Results.

Presentation of all educational materials including posters, binders, and training sessions occurred smoothly and without major problems. The six posters were all hung in high traffic areas of the clinic to be seen by the largest amount of patients possible. Assessing the impact of these posters is difficult; however, the clinic staff has committed to referring patients to them on a regular basis to maximize their usage. The small and large binders were also given to the clinic staff and will serve as an important resource for educating future diabetic patients. Again, the impact of these materials is difficult to assess as the researchers are not directly involved in their implementation, but the staff has committed to using the posters regularly with their patients. The impact and practicality of all the materials used in the diabetes training sessions were able to be immediately assessed because the researchers, acting as presenters, were more intimately involved in their utilization.

The results of the diabetes training sessions exceeded the expectations of the research group. Students that attended each session expressed their deep gratitude for the information that was presented. Many students also expressed appreciation for the education that would now be available to the surrounding communities through those who had completed the program. The students confirmed that diabetes and techniques

for management were presented in a clear and practical way. More importantly, at the culmination of the training, each student was able to independently set attainable goals that would positively impact their health. Not only were the students able to identify practical goals, but they were given the training to identify potential challenges and were adequately equipped to overcome them. For example, some goals that were established were eating two tortillas per meal instead of four, exercising for ten minutes a day and then increasing the time, and choosing water more than other sugary drinks. Some challenges that the group identified were overcoming cultural meal norms, changing the diet of their families as a whole, exercising in small spaces or with little time, and making healthy choices in social settings or at celebrations. As each student presented their goal and anticipated challenges to the group, the student was not only entering into accountability with their peers, but also forming a community to be encouraged by in the coming weeks.

The students also expressed that it was important to them to learn that they must do more than just take their medication. On day three, the researchers stressed that while medication is prescribed to lower the blood glucose, it is important that a person also have a healthy diet and exercise daily to adequately manage their diabetes. This education was especially interesting to the students as many thought that taking the medication would completely cure their diabetes. Students were also very interested to learn about the importance of eating consistent, healthy meals. Many students reported symptoms of hypoglycemia on days when they took their medication and did not eat. Explaining the importance of adequate nutrition while taking a diabetes medication proved to be a vital portion of the training.

Many students were eager to express how the training had impacted them. The following testimonies have been paraphrased and included to capture the influence of the training on a few featured students:

> "*I am so glad you came to Guatemala to teach us about diabetes. We have never heard any of this information before and have been greatly impacted. My mother is sick in the hospital right now and I am going to go and tell her all of the things I have learned. I am also going to start having a better diet and exercising more along with taking my medication so that I can live a longer life. I do not want to lose my mother and I do not want my children to lose their mother."*
>
> *"I am so thankful that you have come to teach us about diabetes. It is exciting to think that my family and I will be able to have a better life after we make the changes you have been teaching us about."*
>
> *"I am excited to take what I have learned back to my community and tell more people about how we can overcome diabetes. After the first day I went home and told my sister that she needed to come to the training because what you all were saying was so good."*

Many additional testimonies expressed a similar message of gratitude. Students were overjoyed that they finally felt that they were able to understand what diabetes was and why it made them feel sick. Those who completed the training course were excited to implement what they had learned at home. However, each student realized that the changes they needed to make would not be easy and that they would get frustrated.

Many students verbally praised God and rejoiced in the confidence they had in His faithfulness to help them make healthy choices.

As described in chapter three of the paper, the research group expected certain barriers to the project's effectiveness. Barriers included language, material translation, and cultural differences such as diet norms and treatment techniques. To overcome the language barrier, two translators were hired by the researchers to help the group's teachings to be as effective as possible. The research group emphasized the importance of having translators with adequate medical vocabulary and clear communication skills. The translators that were hired for the training far exceeded the expectations of the research group. The medical knowledge and cultural expertise of the translators allowed the training sessions to achieve a high level of effectiveness. Adequate translation of the educational materials was completed before the teaching began, ensuring no major mistakes in translation existed. The cultural barrier was overcome in a number of different ways. Before the training sessions, the research group met to discuss what would be taught the next day as well as any predicted cultural discrepancies. Taking time to preview material for the next day allowed the researchers to be as prepared as possible for the coming day's challenges. During each session, unforeseen cultural differences arose. For example, one student reported he believed his diabetes diagnosis was the result of his spouse being murdered earlier that year. At these moments, the research group paused to think about their response, relying on the expertise of the translators to answer questions.

The project also faced barriers to sustainability. While the materials created by the research group are adequate and readily available for use, further utilization relies on

continued willingness of others in Guatemala to steward the materials. This barrier was seemingly overcome by the clinic staff's verbalized willingness to continue using the materials they were given. The translators that worked with the research group during the diabetes training also expressed interest in using the education materials to continue providing training sessions to other groups throughout Guatemala City.

Literature review.

Although there were barriers that threatened the efficacy of this project, the methods were validated by both the students receiving diabetes education and other studies found in the literature. For example, a study completed in Florida Aceituno Guatemala by R. G. Feachem, showed that simple hygiene education can significantly decrease the incidence of diarrheal disease (Feachem, 1984). The project aimed to educate the mothers of young children on simple hygiene tasks, such as proper hand washing, in order to prevent diarrheal disease (Feachem, 1984). Amazingly, the incidence of diarrheal decreased by 32-36% in children aged 0-71 months during the peak diarrhea season in the small village (Feachem, 1984). The posters that were created for this research project aimed to accomplish a similar goal: simple hygiene education in order to prevent sanitation-related diseases. According to the study above, the posters outlining hand washing practices and water sanitation have the potential to lower diarrheal disease rates within Corazon de Amor Health Clinic's population.

Unfortunately, there has not been a significant amount of research done on the efficacy of providing nutrition education to prevent malnutrition. Many studies on malnutrition, specifically in Guatemala, only outline the prevalence and risk factors that exist for those most severely malnourished. However, there is a large amount of research

that supports the effectiveness of education for the prevention of many other avoidable conditions.

Diabetes education has been extensively studied in many countries as a powerful tool for self-management of the disease. However, in Guatemala many of these studies take place in rural communities. For example, in a study completed with the Tzu'utujil Mayan people of rural Guatemala, where there is little knowledge of T2DM, culturally relevant educational materials were presented by community members to diabetic patients (Micikas et al, 2014). The study was very successful as many patients demonstrated an improved understanding of T2DM through the use of a pre- and post-test (Micikas et al, 2014). The participants also showed decreased A1c levels four months following the training (Micikas et al, 2014). This study shows how education can transform a diabetic patient's well-being and lead to improved health outcomes. Although the study was done in a rural community and with slightly different methods, it still serves as validation for the goals of this project. In the future, including community leadership could further improve the efficacy of the education created in this project.

Spending time in Guatemala confirmed that malnutrition, sanitation, and diabetes are detrimental problems in the population that Corazon de Amor Health Clinic serves. Furthermore, diabetes education is lacking in Guatemala as a whole, allowing the disease to tragically affect thousands of people. The poverty and health disparities of Guatemala's people and their health system were also confirmed through the testimonies of students, patients, and the translators. Overall, Guatemala is in the midst of a significant healthcare crisis; however, through preventative education like that provided

to Corazon de Amor Health Clinic, the country can begin to move in the right direction toward health.

Limitations

The project was designed to deliver effective diabetes education for patients in the Corazon de Amor Health Clinic and the Guatemalan diabetic population at large. However, several limitations were identified throughout the implementation of the project plan that must be taken into consideration going forward. The first noteworthy drawback was the limited number of visual aids utilized during classroom education. Although the plan incorporated PowerPoint slides with illustrations, the presentation was inadequate in demonstrating proportion sizes and further engaging the audience. Various students experienced difficulty with accurately visualizing and quantifying portions, grams, and ounces without having examples in hand.

The second limitation was a diminished attendance level of approximately 25 percent throughout the course of instruction due to various factors. The education plan was designed at a basic level in order to accommodate diabetic patients with varying levels of education; however, a few knowledgeable students believed that the basic level was not effective. A few students demonstrated minimal interest in attending the education, which may be attributed to the fact that the education was mandated by the health clinic in order to maximize patient care.

A third limitation was the students' inability to truly differentiate between symptoms of hypoglycemia and hyperglycemia. The majority of the patient population does not have immediate access to blood glucose monitors in order differentiate between high and low blood glucose levels, resulting in each patient relying solely on

symptomatic indicators. The education plan outlined symptoms and measures to correct blood glucose fluctuations; however, minimal emphasis was placed on understanding personal daily requirements of prevention. Interventions such as food journaling, carbohydrate counting, exercise, and medicinal dosing could have been better utilized in order to minimize large fluctuations in blood glucose. Finally, students expressed that appropriate substitutes for diet modification were lacking in diet education. The existing education plan suggests reducing drinks high in sugar and high carbohydrate foods; however, the lesson plan failed to include an adequate number of reasonable alternatives specific to the typical Guatemalan diet.

Further Projects

The needs assessment completed with Corazon de Amor Health Clinic determined that visual resources in the form of posters would be beneficial to address the topics of malnutrition and sanitation. Further projects could benefit from incorporating posters more customized to the unique needs of the target population. Another further project that would provide more focused information regarding malnutrition and sanitation could include creating a detailed pamphlet for further education if patients are interested in learning more. Providing patients with a resource to bring home would help the information to be retained and applied by those persons.

As a result of the completed needs assessment, the research team also decided to focus efforts on creating an educational curriculum encompassing the diagnosis, treatment, and complications of T2DM to teach current diabetics about the condition. Various T2DM educational materials were created and formatted into a three-day curriculum to educate the diabetic patients of the clinic. Each day consisted of different

information, so students who did not attend all three sessions missed out on important information. Further projects could re-format this same curriculum into either a one- or two-day session in an effort to retain students and maximize attendance.

The research team experienced great difficulty in teaching the students to differentiate between episodes of hypoglycemia and hyperglycemia. This hurdle was compounded by the fact home glucose monitoring is virtually non-existent among diabetics at Corazon de Amor Health Clinic. As appropriate differentiation between these two conditions is vital to proper management of diabetes, further projects could provide immense benefit to this population by spending more time educating on the intricacies of hypoglycemia and hyperglycemia. Incorporating daily blood glucose monitoring into the curriculum for each patient would also provide the patients with a baseline knowledge of their own glucose levels. Furthermore, incorporating training on how to utilize a food journal could supplement intermittent blood glucose monitoring in an effort to reduce glucose fluctuations. At the completion of the course, each individual should be counseled regarding their glucose levels and the best methods to address their symptoms. This proposed addition to a future project would certainly add immense value to the diabetes education, as patients would be less likely to suffer from diabetic complications by properly differentiating hypoglycemia from hyperglycemia.

On the final day of diabetes education, many students who had completed the entire course collectively stressed the impact of personal testimony on their motivation to make lifestyle changes to combat their disease. Further projects could focus primarily on compiling individual testimonials in video format, as this component seemed to be the most motivating and differentiating factor for those who were committed to combating

their diabetes. Other beneficial components of the diabetes education were incorporated into the curriculum throughout the education in order to adapt and cater to the population. These additions included visual aids in the form of food/drink options as well as educational handouts regarding various facets of diabetes. Further projects could incorporate a variety of visual aids and educational handouts into the curriculum, as these would make the project more impactful.

The research team acknowledges that more time could be spent on management of diabetes. Due to the lack of resources in this community, lifestyle and diet modifications are especially crucial to each patient's success in overcoming diabetes. With this in mind, a further project could reformat the curriculum to provide greater emphasis on management while minimizing the introductory information regarding diagnosis of diabetes.

Ultimately, the future of this project relies heavily on employees and volunteers at Corazon de Amor Health Clinic. The research team communicated the successes and shortfalls of the project with clinic staff at the completion of the education sessions to influence the outcome of future education sessions. Undoubtedly, many opportunities for further projects exist. Future projects could expand on the diabetes, malnutrition, and sanitation information that has already been created, or they could address the myriad of other health needs of the patients at Corazon de Amor Health Clinic.

Conclusion

Guatemala's healthcare is systematically flawed for a number of reasons. A basic lack of governmental funding makes implementing preventative healthcare services, such as diabetes education, difficult for clinics and hospitals to justify. Furthermore, the

overwhelming poverty, shortage of healthcare workers, and considerable lack of access to care in rural areas provide additional barriers to healthcare services for Guatemalans. This community service project aimed to address preventative healthcare needs at the Corazon de Amor Health Clinic located in Guatemala City.

A needs assessment that was completed by the Corazon de Amor Health Clinic identified a lack of preventative health resources for diabetes, malnutrition, and sanitation. The need for preventative education on T2DM was addressed by creating and implementing an educational course at the Corazon de Amor Health Clinic. After completing a three-day intensive course detailing diabetes causes, testing, complications, and lifestyle modifications, students were optimistic about implementing changes in their lives and spreading what they learned about diabetes in their community. The educational materials and a diabetes diagnosis binder that will be utilized for new diabetic patients were left with the clinic for continued use moving forward. Additional preventative education materials detailing malnutrition and sanitation were provided as posters, which were displayed around the Corazon de Amor Health Clinic.

Overall, what was discovered in the literature review was confirmed by the experiences encountered in Guatemala. By researching the topics included, a comprehensive plan for diabetes education that was catered to patients at the Corazon de Amor Health Clinic was created and provided. Based on the cross-cultural medicine tool post-education survey, the course participants confirmed that the education created was practical and applicable to their daily lives. Furthermore, this education was presented in an understandable manner through the use of translators and bilingual materials. The posters encompassing malnutrition and sanitation were displayed in high-traffic areas

throughout the Corazon de Amor Health Clinic to be easily accessible for the patients. While the project exceeded the expectations of the research group, opportunities exist for further projects as health disparities in Guatemala are incredibly prevalent.

References

Avila, C., Bright R., Gutierrez J., Hoadley K., Manuel C., Romero N., & Rodriguez M. P. (2015). *Guatemala health system assessment, August 2015*. Bethesda, MD: Health Finance & Governance Project, Abt Associates Inc. Retrieved from https://www.usaid.gov/sites/default/files/documents/1862/Guatemala-HSA%20_ENG-FULL-REPORT-FINAL-APRIL-2016.pdf

Barcelo, A., Gregg, E., Perez Flores, E., Wong, R., Gerzoff, R., Cafiero, E., & Meiners, M. (2011). *Survey of diabetes, hypertension and chronic disease risk factors*. Washington, D.C.: Pan American Health Organization.

Bream, K. D., Breyre, A., Garcia, K., Calgua, E., Chuc, J. M., & Taylor, L. (2018). Diabetes prevalence in rural Indigenous Guatemala: A geographic-randomized cross-sectional analysis of risk. *Public Library of Science (Plos) One, 13*(8). doi:10.1371/journal.pone.0200434

Cambridge University Press. (2018a). *Cambridge Dictionary: Developing country [Def. 1]*. Retrieved October, 31, 2018 from https://dictionary.cambridge.org/us/dictionary/english/developing-country

Cambridge University Press. (2018b). *Cambridge Dictionary: Indigenous [Def. 1]*. Retrieved October 26, 2018, from https://dictionary.cambridge.org/us/dictionary/english/indigenous

Central Intelligence Agency. (2018a). The world factbook - Central Intelligence Agency. Retrieved from https://www.cia.gov/library/publications/the-world-factbook/fields/346.html

Central Intelligence Agency. (2018b). The world factbook - Central Intelligence Agency. Retrieved from https://www.cia.gov/library/publications/the-world-factbook/geos/gt.html

Chary, A., Greiner, M., Bowers, C., & Rohloff, P. (2012). Determining adult type 2 diabetes related health care needs in an indigenous population from rural Guatemala: A mixed-methods preliminary study. *Biomed Central (BMC) Health Services Research, 12*(1), 476. doi:10.1186/1472-6963-12-476

Dagogo-Jack, S. (2006). Primary prevention of type-2 diabetes in developing countries. *Journal of the National Medical Association, 98(3), 415*. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2576111/

Directorate-General for International Cooperation and Development [European Commission] (2015). *We can overcome undernutrition: Guatemala case study*. [E-reader Version]. Retrieved from https://publications.europa.eu/en/publication-detail/-/publication/ 4ab3a2ce-9cad-11e5-b792-01aa75ed71a1/language-en. doi: 10.2841/583880

Domeyko, C. (2012, January 6). Diabetes: A Sweet Story. Retrieved from https://www.youtube.com/watch?v=ccLBrDAC4Vs

Encyclopedia Britannica. (2018). Jacobo Arbenz. Retrieved from https://www.britannica.com/biography/Jacobo-Arbenz

Esterson, Y. B., Carey, M., Piette, J. D., Thomas, N., & Hawkins, M. (2014). A Systematic Review of Innovative Diabetes Care Models in Low-and Middle-Income Countries (LMICs). *Journal of Health Care for the Poor and Underserved,25*(1), 72-93. doi:10.1353/hpu.2014.0037

Feachem, R. G. (1984). Interventions for the control of diarrheal diseases among young children: promotion of personal and domestic hygiene. *Bulletin of the World Health Organization,*

62(3), 467-476. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2536318/?page=1

Flood, D., Mux, S., Martinez, B., García, P., Douglas, K., Goldberg, V., . . . Rohloff, P. (2016). Implementation and outcomes of a comprehensive type 2 diabetes program in rural Guatemala. *Public Library of Science (Plos) One, 11*(9). doi:10.1371/journal.pone.0161152.

Griffith, W. J., Horst, O. H., Anderson, T. P., Stansifer & C. L. (2018). Guatemala. Retrieved from https://www.britannica.com/place/Guatemala

Historical Clarification Commission. (1999). *Guatemala: Memory of silence.* Guatemala City: Historical Clarification Commission. Retrieved from https://www.documentcloud.org/documents/357870-guatemala-memory-of-silence-the-commission-for.html

Hu, F. B. (2011). Globalization of Diabetes. *Diabetes Care, 34*, 1249-1257. doi:10.2337/dc11-0442

International Childhood Resource Institute. (2018a). Etapas del Dessarrollo. Retrieved from http://www.globalhealthychildcare.dreamhosters.com/wp-content/uploads/2011/03/ages-stages-s.pdf

International Childhood Resource Institute. (2018b). Cuando lavarse las manos. Retrieved from http://www.globalhealthychildcare.dreamhosters.com/wp-content/uploads/2011/03/WhenToWash-s1.pdf

Life of Hope Ministries (2019). About Life of Hope. Retrieved from https://www.lifeofhope.org/about-us/

Livingstone, G. (2013). The cold war: the Guatemalan coup and Cuban revolution, *America's Backyard: The United States and Latin America from the Monroe Doctrine to the War on*

Terror (pp. . Chicago, Illinois: University of Chicago Press. Retrieved from https://books.google.com/books?id=WH5jDgAAQBAJ&pg=PT31&dq=United+Fruit+company+Banana+republics&hl=en&sa=X&ved=0ahUKEwjnh8TCgdPVAhWr7oMKHdOqCHQ4ChDoAQgnMAA#v=onepage&q=United%20Fruit%20company%20Banana%20republics&f=false

Llanque, R. (December 2015). Community-based impact-oriented child survival in Huehuetenango, Guatemala: Integration of the extension of coverage program (PEC): effects on project outcomes and lessons learned. Curamericas Global, Inc. Retrieved from https://www.curamericas.org/wp-content/uploads/2016/01/Appendix-13-Effects-of-the-Integration-of-the-Extension-of-Coverage-Program.pdf

Merriam-Webster, Incorporated. (2018a). *Diabetes mellitus [Def 1].* Retrieved October 31, 2018, from https://www.merriam-webster.com/dictionary/diabetes%20mellitus

Merriam-Webster, Incorporated. (2018b). *Surface water [Def 1]*. Retrieved October 29, 2018, from https://www.merriam-webster.com/dictionary/surface%20water

Merriam-Webster, Incorporated. (2018c). *Type 2 diabetes [Def 1].* Retrieved October 31, 2018, from https://www.merriam-webster.com/dictionary/type%202%20diabetes

Micikas, M., Foster, J., Weis, A., Lopez-Salm, A., Lungelow, D., Mendez, P., & Micikas, A. (2014). A community health worker intervention for diabetes self-management among the Tzu'utujil Maya of Guatemala. *Sage Journals, 16*(4), 601-608. Doi: 10.1177/1524839914557033

Misra, A., Singhal, N., & Khurana, L. (2010). Obesity, the metabolic syndrome, and type 2 diabetes in developing countries: role of dietary fats and oils. *Journal of the American College of Nutrition,29*(3), 289-301.

Moore, S. O. (Director & Producer) (2010). *Reparando.* [Video file]. Retrieved from https://www.athentikos.com/reparando/

Moffett, L. (2018). Guatemala's history of genocide hurts Mayan communities to this day. Retrieved from http://theconversation.com/guatemalas-history-of-genocide-hurts- mayan-communities-to-this-day-97796

National Institute of Diabetes and Digestive and Kidney Diseases. (2016). Diabetes Overview. Retrieved from https://www.niddk.nih.gov/health-information/diabetes/overview

Organization for Economic Co-operation and Development. (2017). Health expenditure and financing. Retrieved from https://stats.oecd.org/Index.aspx?DataSetCode=SHA

Pan American Health Organization. (2015a). Country report: Guatemala. Retrieved from https://www.paho.org/salud-en-las-americas-2017/?page_id=127

Pan American Health Organization. (2015b). PAHO mortality data: Avoidable mortality. Retrieved from https://hiss.paho.org/pahosys/ame.php

Pan American Health Organization. (n.d.). Desinfección solar del agua. Retrieved from http://www.designerbeatriz.com/Water-Purification-Project-English-Spanish

Pan American Health Organization. (2018). Health in the Americas: Guatemala. Retrieved from https://www.paho.org/salud-en-las-americas-2017/?p=3338

Pan American Health Organization. (2014). Health information platform for the Americas: Leading causes of death. Retrieved from http://www.paho.org/data/index.php/en/ indicators-mortality/mnu-lcd-en.html?showall=&start=2

PBS News Hour. (2011). Timeline: Guatemala's brutal civil war. Retrieved from https://www.pbs.org/newshour/health/latin_america-jan-june11-timeline_03-07

Rabie, T. & Curtis, V. (2006), Handwashing and risk of respiratory infections: A quantitative systematic review. Tropical Medicine & International Health, 11: 258-267. doi:10.1111/j.1365-3156.2006.01568.x

Schoultz, L. (1998). Combating communism with friendly dictators, *Beneath the United States: A history of US policy toward Latin America* (pp. 335-348). Cambridge, MA: Harvard University Press.

United States Department of Agriculture. (n.d.). Aliméntate bien para jugar con ganas. Retrieved from https://fns-prod.azureedge.net/sites/default/files/sump_spminiposter.pdf

University of Nebraska-Lincoln. (2018). Wash Your Hands. Retrieved from https://food.unl.edu/documents/Wash%20Your%20Hands-Bilingual-Color.pdf

Wild, S., Roglic, G., Green, A., Sicree, R., & King, H. (2004). Global Prevalence of Diabetes. *Diabetes Care,27*(5), 1047-1053. doi:10.2337/diacare.27.5.1047

World Bank. (2016). Guatemala: An assessment of poverty. Retrieved from http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTPOVERTY/EXTPA/0,,contentMDK:20207581~menuPK:443285~pagePK:148956~piPK:216618~theSitePK:430367,00.html

World Bank. (2018). Guatemala's water supply, sanitation, and hygiene poverty diagnostic: Challenges and opportunities.WASH Poverty Diagnostic. World Bank, Washington, DC. Retrieved from https://openknowledge.worldbank.org/handle/10986/29454

World Health Organization (2016). *Global Report on Diabetes*. Geneva, Switzerland. Retrieved from http://apps.who.int/iris/bitstream/handle/10665/204871/9789241565257_eng.pdf?sequence=1

World Health Organization (2015). Guatemala: WHO statistical profile. Retrieved from http://www.who.int/gho/countries/gtm.pdf?ua=1

World Health Organization. (2018a). Nutritional Landscape Information System. Retrieved from http://apps.who.int/nutrition/landscape/report.aspx?iso=gtm

World Health Organization (2018b). Health topics: Malnutrition. Retrieved from http://www.who.int/topics/malnutrition/en/

World Health Organization. (2018c). Nutrition: Stunting in a nutshell. Retrieved from http://www.who.int/nutrition/healthygrowthproj_stunted_videos/en/

World Health Organization (2018d). Global health observatory country views: Guatemala statistics summary (2002-present). Retrieved from http://apps.who.int/gho/data/node.country.country-GTM

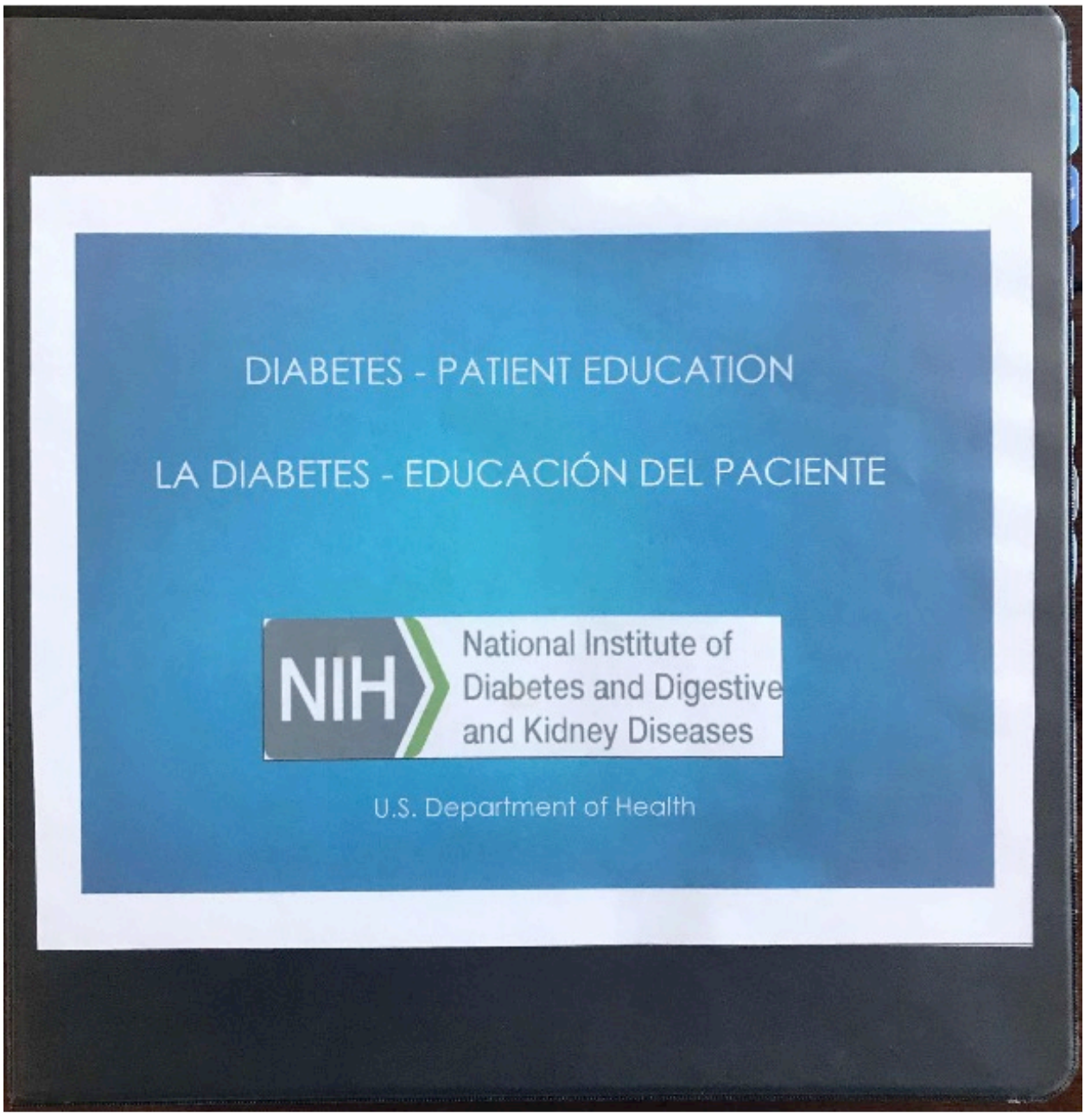
World Health Organization (2018e). Millennium Development Goals (MDGs). Retrieved from https://www.who.int/topics/millennium_development_goals/en/

World Health Organization. (2012a). Water sanitation hygiene. Retrieved from http://www.who.int/water_sanitation_health/monitoring/jmp2012/key_terms/en/

World Health Organization (2012b). *Prevention and control of noncommunicable diseases : Guidelines for primary health care in low resource settings.* Geneva, Switzerland. Retrieved from http://apps.who.int/iris/bitstream/handle/10665/76173/9789241548397_ eng.pdf?sequence=1

World Population Review. (2018). Guatemala population 2018 (demographics, maps, graphs). Retrieved from http://worldpopulationreview.com/countries/guatemala-population

APPENDIX A:
Diabetes Patient Education Binder


DIABETES - PATIENT EDUCATION
LA DIABETES - EDUCACIÓN DEL PACIENTE
NIH
National Institute of
Diabetes and Digestive
and Kidney Diseases
U.S. Department of Health

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10	Managing Diabetes: -Glucose Monitoring -4 Steps to Management for Life -Management During Sick Days	https://www.niddk.nih.gov/health-information/diabetes/overview/managing-diabetes
11	Know Your Blood Sugar Numbers	https://www.niddk.nih.gov/health-information/diabetes/overview/managing-diabetes/know-blood-sugar-numbers
12	Insulin, Medicine & Other Treatment	https://www.niddk.nih.gov/health-information/diabetes/overview/insulin-medicines-treatments
13	Diet & Physical Activity -Carbohydrate Counting	https://www.niddk.nih.gov/health-information/diabetes/overview/diet-eating-physical-activity
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APPENDIX B:
Diabetes Training PowerPoint Presentation

Diabetes Training

Corazon De Amor Clinica Medica, Guatemala

1

What is diabetes?

Diabetes is a disorder that disrupts the way your body uses sugar.

2

¿Qué es la diabetes?

La diabetes es un trastorno que altera la manera en que el organismo usa el azúcar.

3

Risk Factors

- Obesity
- Genetics
- Ethnicity? (Hispanics)
- Smoking
- Improper Nutrition

4

Factores de riesgo

- La obesidad
- La genetica
- Etnicidad
- El tabaco
- Nutricion inadecuada

5

Symptoms

- Increased Thirst & Urine
- Increased Hunger
- Fatigue
- Blurred Vision
- Numbness/Tingling
- Non-healing Sores
- Unexplained Weight Loss

National Institute of Diabetes and Digestive and Kidney Diseases (2016). Diabetes Overview: Symptoms and Causes. Retrieved from: https://www.niddk.nih.gov/health-information/diabetes/overview/symptoms-causes

6

Síntomas

- aumento de la sed y de las ganas de orinar
- aumento del apetito
- fatiga
- visión borrosa
- entumecimiento u hormigueo en las manos o los pies
- úlceras que no cicatrizan
- pérdida de peso sin razón aparente

National Institute of Diabetes and Digestive and Kidney Diseases (2016). Información general sobre la diabetes: Síntomas y causas de la diabetes. Retrieved from: https://www.niddk.nih.gov/health-information/informacion-de-la-salud/diabetes/informacion-general/sintomas-causas

7

Prevention

Losing weight through healthy eating and regular physical activity can help you prevent type 2 diabetes.

- Lose weight and keep it off
- Move more
- Eat healthy foods most of the time

National Institute of Diabetes and Digestive and Kidney Diseases (2016). Diabetes Overview: Preventing Type 2 Diabetes. Retrieved from: https://www.niddk.nih.gov/health-information/diabetes/overview/preventing-type-2-diabetes

8

Prevención

Bajar de peso con una alimentación saludable y actividad física regular puede ayudar a prevenir la diabetes tipo 2.

- Baje de peso y no vuelva a aumentarlo
- Muévase más
- Aliméntese sanamente la mayor parte del tiempo

National Institute of Diabetes and Digestive and Kidney Diseases (2016). Información general sobre la diabetes: Cómo prevenir la diabetes tipo 2. Retrieved from: https://www.niddk.nih.gov/health-information/informacion-de-la-salud/diabetes/informacion-general/prevenir-tipo-2

9

Testing and Diagnostics

Diagnosis	A1C (percent)	Fasting plasma glucose (FPG)[a]
Normal	below 5.7	99 or below
Prediabetes	5.7 to 6.4	100 to 125
Diabetes	6.5 or above	126 or above

What tests are used?

- Fasting plasma glucose test
  - No eating/drinking for 8 hours prior to test
- A1C test
  - Average blood glucose over past 3 months

10

Pruebas y diagnóstico de la diabetes

Diagnóstico	A1C (porcentaje)	Glucosa plasmática en ayunas (GPA)
Normal	Por debajo de 5.7	Por debajo de 99
Prediabetes	5.7 a 6.4	100 a 125
Diabetes	Por encima de 6. 5	Por encima de 126

¿Qué pruebas se utilizan?

- Glucosa plasmática en ayunas
  - No comer / beber durante 8 horas antes de la prueba
- Prueba A1C
  - Promedio de glucosa en sangre en los últimos 3 meses

11

Management

- A1c below 7
- Blood pressure below 140/90
- Learn to manage/ lower stress
- Eat well
- Be active
- Take medications as advised, even if you feel good
- Stop smoking

12

Controlar la diabetes

- A1c por debajo de 7
- Presión arterial por debajo de 140/90
- Aprende a manejar/disminuir el estrés.
- Comer bien
- Ser activo
- Tome los medicamentos como se le indique, incluso si se siente bien.
- Deja de fumar

13

Medications

Oral medication

- Metformin
  - Lowers liver production of glucose
  - Helps body to use insulin better
  - May help with weight loss

Injectable medication

- Insulin
  - Rotate spot of injection : belly, thigh, buttocks, upper arm
  - Follow doctor recommendation on when/how to use insulin

14

Medicación

Medicación oral

- Metformina
  - Disminuye la producción hepática de glucosa
  - Ayuda al cuerpo a usar mejor la insulina
  - Puede ayudar con la pérdida de peso

Medicación inyectable

- Insulina
  - Rotar la zona de inyección: vientre, muslo, glúteos, parte superior del brazo
  - Siga las recomendaciones del médico sobre cuándo y cómo usar la insulina

15

Side effects

Possible problem that results from diabetes medicine

- Hypoglycemia
  - Blood glucose that is too low
  - Prevent this by balancing medicine with food/activity
- Upset stomach
- Weight gain

Take medicine as instructed to help prevent side effects/problems. Let your doctor know of any side effects.

16

Efectos secundarios

Posible problema que resulta de la medicina para la diabetes

- Hipoglucemia
  - Glucosa en sangre demasiado baja
  - Prevenga esto equilibrando la medicina con la comida / actividad
- Malestar estomacal
- Aumento de peso

Tome los medicamentos como se le indique para ayudar a prevenir los efectos secundarios / problemas. Informe a su médico de cualquier efecto secundario.

17

Diabetes Diet and Eating

- What you choose to eat, how much you eat, and when you eat are all important in keeping your blood glucose level in the range that your health care team recommends.

18

Nutrición y dieta si se tiene diabetes

- Qué, cuánto y cuándo comer es importante para mantener su nivel de glucemia dentro de los límites recomendados por su equipo de atención médica.

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Diabetes Diet and Eating

- Vegetables
  - Non-starchy: broccoli, carrots, greens, peppers, and tomatoes
  - Starchy: potatoes, corn, and green peas
- Fruits
  - Includes oranges, melon, berries, apples, bananas, and grapes
- Grains—at least half of your grains for the day should be whole grains.
  - Includes wheat, rice, oats, cornmeal, barley, and quinoa
  - Examples: bread, pasta, cereal, and tortillas
- Protein
  - Lean meat, chicken or turkey without the skin, fish, eggs, nuts and peanuts, dried beans and certain peas, such as chickpeas and split peas, meat substitutes, such as tofu
- Dairy - nonfat or low fat, milk or lactose-free milk if you have lactose intolerance, yogurt, cheese

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Nutrición y dieta si se tiene diabetes

- Verduras
  - Sin almidón: brócoli, zanahorias, vegetales de hojas verdes, pimientos y tomates
  - Ricas en almidón: papas, maíz y arvejas
- Frutas
  - Incluye naranjas, melones, fresas, manzanas, bananos y uvas
- Granos– por lo menos la mitad de los granos del día deben ser integrales
  - Incluye trigo, arroz, avena, maíz, cebada y quinua
  - Ejemplos: pan, pasta, cereales y tortillas
- Proteínas
  - Carne magra (con poca grasa), pollo o pavo sin el pellejo, pescado, huevos, nueces y maní, fríjoles secos y otras leguminosas como garbanzos y guisantes partidos y sustitutos de la carne, como el tofu
- Lácteos descremados o bajos en grasa - leche o leche sin lactosa si usted tiene intolerancia a la lactosa, yogur y queso

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Diabetes Diet and Eating

- Foods and drinks to limit include:
  - Fried foods and other foods high in saturated fat and trans fat
  - Foods high in salt, also called sodium
  - Sweets, such as baked goods, candy, and ice cream
  - Beverages with added sugars, such as juice, regular soda, and regular sports or energy drinks

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Nutrición y dieta si se tiene diabetes

- Los alimentos y bebidas que hay que limitar incluyen:
  - Alimentos fritos y otros ricos en grasas saturadas y grasas trans
  - Alimentos con alto contenido de sal, también llamado sodio
  - Dulces, como productos horneados, dulces y helados
  - Bebidas con azúcares agregados, como jugos, gaseosas y bebidas regulares para deporte o energéticas

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Exercise

- Physical activity is an important part of managing your blood glucose level and staying healthy. Being active has many health benefits Including:
  - Lower blood glucose levels
  - Lower blood pressure
  - Improved blood flow to the rest of your body
  - Improved mood
  - Improved sleep at night

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¿Por qué debo hacer actividad física si tengo diabetes?

- La actividad física es importante para el control de los niveles de glucosa en la sangre y para mantenerse saludable. La actividad física tiene muchos beneficios para la salud.
  - Reduce los niveles de glucosa en la sangre
  - Baja la presión arterial
  - Mejora la circulación de la sangre
  - Mejora su estado de ánimo
  - Puede ayudarle a dormir mejor

25

Exercise

- If you are overweight, combining physical activity with a reduced-calorie eating plan can lead to even more benefits.
- Many people choose walking with friends or family members for their activity.
- If you are sitting for a long time, such as working at a desk or watching TV, do some light activity for 3 minutes or more every half hour.
  - Light activities include: leg lifts or extensions, overhead arm stretches, desk chair swivels, torso twists, side lunges, walking in place
- Stretching exercises are light or moderate physical activity. When you stretch, you increase your flexibility, lower your stress, and help prevent sore muscles.

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Ejercicio

- Si usted tiene sobrepeso, combinar la actividad física con un plan de alimentación con reducción de calorías puede tener aún más ventajas.
- Muchas personas prefieren caminar con sus amigos o parientes como forma de hacer ejercicio.
- Si permanece sentado mucho tiempo trabajando en su escritorio o viendo televisión, haga alguna actividad ligera durante 3 o más minutos cada media hora. Las actividades ligeras incluyen:
  - Levantar o extender las piernas, estirar los brazos por encima de la cabeza, girar en la silla del escritorio, hacer giros del torso, hacer inclinaciones laterales y caminar en el lugar (sin moverse del mismo sitio)
- Los ejercicios de estiramiento son una actividad física leve o moderada. Los estiramientos aumentan la flexibilidad, disminuyen el estrés y ayudan a prevenir el dolor muscular.

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Problems and Complications

- **Heart disease and stroke**
- **Low blood glucose**
- **Nerve damage**
- **Kidney disease**
- **Foot problems**
- **Eye disease**
- **Mouth problems**
- Sexual and bladder problems
- Depression
- Cancer
- Dementia
- Sleep apnea

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Problemas y complicaciones

- **Enfermedad cardíaca y accidente cerebrovascular**
- **Bajo nivel de glucosa en sangre**
- **Daño en el nervio**
- **Enfermedad del riñon**
- **Problemas en los pies**
- **Enfermedad ocular**
- **Problemas en la boca**
- Problemas sexuales y vesicales.
- Depresión
- Cáncer
- Demencia
- Apnea del sueño

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Heart Disease & Stroke

- Having diabetes means that you are more likely to develop heart disease and have a greater chance of a heart attack or a stroke.
  - Call 9-1-1 if you have the warning signs of a heart attack or stroke.
- The good news is that the steps you take to manage your diabetes also help to lower your chances of having heart disease or stroke.
  - Smoking raises your risk of developing heart disease.
  - If you have high blood pressure , your heart must work harder to pump blood.
  - Being overweight or obese can affect your ability to manage your diabetes and increase your risk for many health problems, including heart disease and high blood pressure.

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La Diabetes, las Enfermedades del Corazón y los Ataques Cerebrales

- Si tiene diabetes, es más probable que tenga problemas o enfermedades del corazón y una mayor probabilidad de un ataque al corazón o un ataque cerebral (derrame cerebral).
  - Llame al 9-1-1 si tiene las señales de aviso de un ataque al corazón o un ataque cerebral.
- La buena noticia es que las medidas que usted toma para controlar su diabetes también ayudan a reducir su probabilidad de tener una enfermedad del corazón o un ataque cerebral.
  - Fumar aumenta el riesgo de tener enfermedades del corazón.
  - Si usted tiene la presión arterial alta , el corazón debe esforzarse más para bombear la sangre.
  - El sobrepeso y la obesidad pueden afectar su capacidad para controlar la diabetes y aumentar el riesgo de tener muchos problemas de salud, como las enfermedades del corazón y la presión arterial alta.

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Low Blood Glucose

Hypoglycemia Symptoms		
Mild-to-Moderate		Severe
• Shaky or jittery • Sweaty • Hungry • Headachy • Blurred vision • Sleepy or tired • Dizzy or lightheaded • Confused or disoriented • Pale	• Uncoordinated • Irritable or nervous • Argumentative or combative • Changed behavior or personality • Trouble concentrating • Weak • Fast or irregular heart beat	• Unable to eat or drink • Seizures or convulsions (jerky movements) • Unconsciousness

How do I treat hypoglycemia?

- If you begin to feel one or more hypoglycemia symptoms:
  - 1/2 cup (4 ounces) of fruit juice—not low-calorie or reduced sugar*
  - 1/2 can (4 to 6 ounces) of soda—not low-calorie or reduced sugar
  - 1 tablespoon of sugar, honey, or corn syrup

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Bajo nivel de glucosa en la sangre

Síntomas de la hipoglucemia		
Leve a moderada		Severa
• Temblores o nervios • Sudoración • Hambre • Dolor de cabeza • Visión borrosa • Somnolencia o cansancio • Mareo o aturdimiento • Confusión o desorientación • Palidez	• Descoordinación • Irritabilidad o nerviosismo • Argumentación o combate • Conducta o personalidad cambiante • Problemas para concentrarse • Debilidad • Ritmo cardiaco rápido o irregular	• Incapacidad de comer o beber • Ataques o convulsiones (movimientos espasmódicos) • Pérdida del conocimiento

¿Cómo trato la hipoglucemia?

- Si comienza a presentar uno o más síntomas de la hipoglucemia:
  - ½ taza (4 onzas) de jugo de frutas, que no sea bajo en calorías o en azúcar*
  - ½ lata (4 a 6 onzas) de soda, que no sea baja en calorías o en azúcar
  - 1 cucharada de azúcar, miel, o jarabe de maíz

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Nerve Damage

Diabetic neuropathy is nerve damage that can occur in people with diabetes. Different types of nerve damage cause different symptoms. Symptoms can range from pain and numbness in your feet to problems with the functions of your internal organs, such as your heart and bladder.

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Neuropatías diabéticas

La neuropatía diabética es un daño a los nervios que puede ocurrir en personas con diabetes. Diferentes tipos de daño a los nervios causan diferentes síntomas. Los síntomas pueden variar desde dolor y adormecimiento en los pies hasta problemas con las funciones de los órganos internos, como el corazón y la vejiga.

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Kidney Disease

- Diabetes is the leading cause of kidney disease
- The main job of the kidneys is to filter wastes and extra water out of your blood to make urine, control blood pressure, and make hormones
- High blood glucose, also called blood sugar, can damage the blood vessels in your kidneys.
- Most people with diabetic kidney disease do not have symptoms
- Reach your blood glucose goals
- Control your blood pressure
- Healthy habits
- Take medicines as prescribed

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La enfermedad de los riñones causada por la diabetes

- La diabetes es la causa principal de las enfermedades de los riñones.
- El trabajo principal de los riñones es filtrar los desechos y el exceso de agua en la sangre en forma de orina, controlar la presión arterial y a producir las hormonas
- Un nivel alto de azúcar en la sangre, también conocida como glucosa en la sangre, puede dañar los vasos sanguíneos de los riñones.
- La mayoría de las personas con la enfermedad de los riñones causada por la diabetes no tienen síntomas
- Alcance sus niveles ideales de glucosa en la sangre
- Controle su presión arterial
- hábitos saludables en el estilo de vida
- Tome las medicinas siguiendo las indicaciones

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Foot Problems

- Nerve damage
- Lower the amount of blood flow in your feet
- Gangrene / Infection
- Amputation
- Foot ulcers

Tips to Take Care of Your Feet

- Check your feet every day.
- Wash your feet every day.
- Smooth corns and calluses gently.
- Trim your toenails straight across.
- Wear shoes and socks at all times.
- Protect your feet from hot and cold.
- Keep the blood flowing to your feet.
- Get a foot check at every health care visit

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La diabetes y los problemas de los pies

- daño de los nervios
- disminuir la cantidad de flujo sanguíneo en los pies
- infección / gangrena
- Amputar
- las úlceras del pie

Sugerencias para el cuidado de los pies

- Revísese los pies todos los días.
- Lávese los pies todos los días.
- Límese suavemente los callos y calloslidades.
- Córtese las uñas de los pies en línea recta.
- Siempre use zapatos y calcetines.
- Protéjase los pies del calor y el frío.
- Ayude a mantener el flujo sanguíneo en los pies.
- Pida que le revisen los pies en cada visita médica.

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Eye Disease

Normal Vision

Diabetic Retinopathy

Glaucoma

Cataracts

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Las enfermedades diabéticas del ojo

Vista normal

La retinopatía diabética

El glaucoma

Las cataratas

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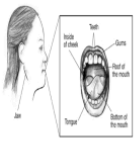
Dental Problems



- Red, swollen, and bleeding gums
- Gums that have pulled away from the teeth
- Bad breath that won't go away
- Changes in the way your teeth fit together when you bite
- Sore, white—or sometimes red—patches on your gums, tongue, cheeks, or the roof of your mouth
- Mouth sores or infection
- Burning feeling in the mouth

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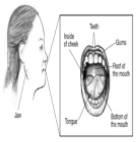
Mantenga la boca sana



- encías rojas, inflamadas y sangrantes
- encías que se han retirado de los dientes
- mal aliento que no desaparece
- cambios en la forma en que los dientes se
- áreas dolorosas, blancas o a veces rojas en las encías, la lengua, las mejillas o el techo de la boca
- llagas o infección en la boca
- sensación de quemazón en la boca

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Conclusion

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Conclusión

45

References

National Institute of Diabetes and Digestive and Kidney Diseases. (2016). Diabetes Overview. Retrieved from https://www.niddk.nih.gov/health-information/diabetes/overview

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Suggestion to Future Non-Guatemalan Diabetes Educators:

The following questions can be used to assess the trainees' readiness to learn, as well as improve the educators understanding of the potential cultural, emotional, and intellectual barriers present for that specific trainee group:

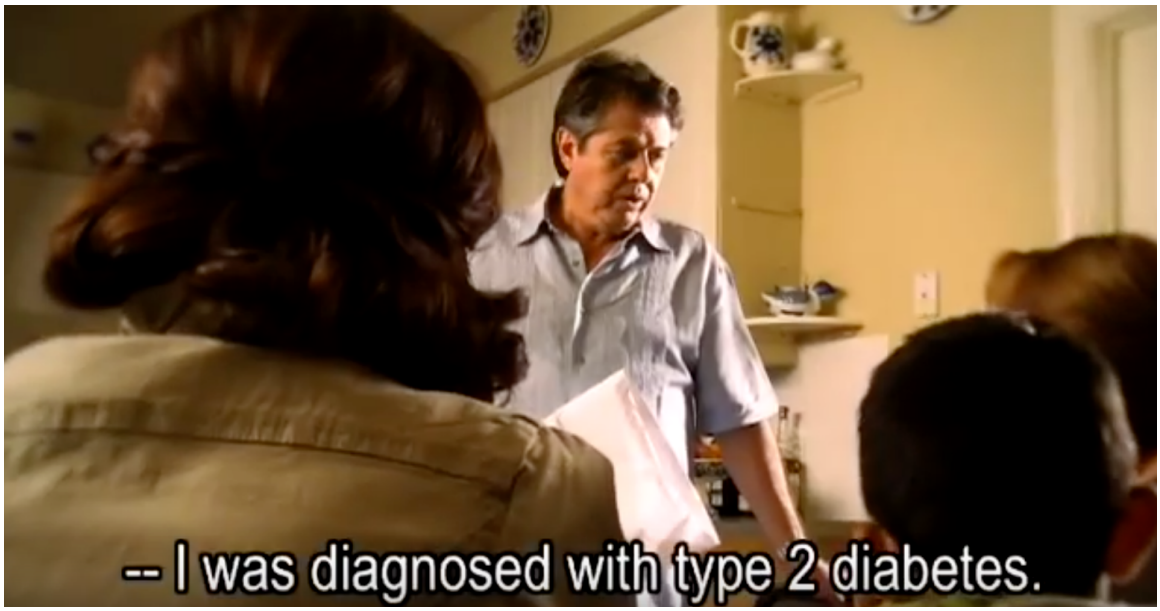
1. How do you define diabetes?
2. What do you fear most about diabetes?
3. What do you currently do to manage your diabetes?
4. What aspects of the disease would you like to receive more education about?

After the training is complete the following set of questions can be used to assess the trainees' knowledge as well as help facilitate discussion to build comradery among the group moving forward. Answers to these questions also help to improve the training for the next meeting.

1. What did you learn from the education presented?
2. What were you most surprised about?
3. What challenges in managing your diabetes do you anticipate encountering after you leave today?

The purpose of these questions is to improve cultural sensitivity for non-Guatemalan educators and are provided for use at the discretion of the educators.

APPENDIX C:
Diabetes: A Sweet Story, Patient Testimonial



Source: https://www.youtube.com/watch?v=ccLBrDAC4Vs

APPENDIX D:
Initial Diabetes Diagnosis Education

TABLE OF CONTENTS

¿Qué es la diabetes?

La diabetes es un trastorno
que altera la manera en que el organismo usa el azúcar.

1

Todas las células del cuerpo necesitan azúcar para funcionar normalmente.

El azúcar entra en las células con la ayuda de una hormona llamada **insulina**.

Si no hay insulina suficiente o si el cuerpo deja de responder a la insulina, el azúcar se acumula en la sangre. Esto es lo que les sucede a las personas con **diabetes**.

2

¿Cuáles son los síntomas de la diabetes?

En general, la diabetes **no provoca síntomas**.

Cuando aparecen síntomas, pueden ser los siguientes, entre otros:

- Necesidad de orinar con frecuencia
- Sed intensa
- Visión borrosa

3

Si la diabetes tipo 2 no suele provocar síntomas, ¿por qué debe importarme?

Si bien es posible que la diabetes tipo 2 no le produzca ningún malestar, con el tiempo puede causar problemas graves si no se trata. El trastorno puede generar:

4

¿Puedo prevenir estas complicaciones?

¡SÍ!

Puede controlar su diabetes por:

- Ejercicio físico
- Dejar de fumar
- Dieta saludable
- Tomar medicación como lo indique su médico

5

¿Cuánto debo hacer ejercicio?

Debe hacer ejercicio durante 20-30 minutos 5 días a la semana.

6

¿Qué debería comer?

- Es muy importante comer muchas verduras.
- Reduzca el consume de elimentos que contienen azúcar
- Use menos gras, azucar y sal
- Dulces sólo se deben comer de vez en cuando o en días especiales

7

¿Qué es un carbohidrato?

Carbohidrato es una palabra para alimentos que tienen **almidón**, **azúcar** y **fibra**. Tener demasiados carbohidratos en una comida puede hacer que su **azúcar en la sangre suba demasiado**. Un nivel alto de azúcar en la sangre aumenta el riesgo de **complicaciones graves**.

Algunos alimentos que contienen carbohidratos: pan, fideos, arroz, tortillas, frijoles y muchos más.

8

¿Qué alimentos debo evitar?

pan

coca

patatas fritas

helado

9

¡Su médico estará aquí para ayudarlo en cada paso del camino! Asegúrese de hacer preguntas si no entiende algo sobre la diabetes acerca de cómo puede ayudar a prevenir complicaciones.

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APPENDIX E:
MiPlato, Educational Poster


Aliméntate bien para jugar con ganas
Usa MiPlato para ayudarte a consumir alimentos de cada grupo alimenticio.
Frutas
Granos
Lácteos
Vegetales
Proteína
MiPlato
ChooseMyPlate.gov
¡Mantente en movimiento!
Necesitas al menos 60 minutos de actividad física todos los días. Ya sea que uses la patineta, lances una pelota o juegues a Tú la Llevas, ¡cada actividad cuenta!
USDA
Serving Up MyPlate
U.S. Department of Agriculture • Food and Nutrition Service • Septiembre de 2012 • FNS-458-S
USDA es un proveedor e empleador que ofrece oportunidad igual para todos.


FRUTAS Aliméntate con frutas en las comidas o como refrigerios
Naranjas, peras, moras, sandía, duraznos, pasas y puré de manzana (sin azúcar adicional) son algunas de las mejores opciones. Asegúrate de que tu jugo sea 100% jugo de fruta.
VEGETALES Ponle color a tu plato con vegetales sabrosos
Trata de consumir más vegetales color verde oscuro, rojo y anaranjado, además de frijoles y legumbres.
GRANOS Haz que por lo menos la mitad de los productos de grano que consumas sean integrales
Escoge con más frecuencia alimentos de granos enteros, como pan integral, avena, tortillas integrales, arroz integral, y palomitas de maíz bajas en grasa.
PAN INTEGRAL
CEREAL DE GRANO INTEGRAL
PROTEÍNA Varía las proteínas que consumes
Prueba pescado, mariscos, frijoles y legumbres con más frecuencia. Algunas formas deliciosas incluyen burrito de frijoles, humus, chili con verduras, taco de pescado, estofado de mariscos, o salmón a la plancha.
ATÚN
LÁCTEOS Consume alimentos ricos en calcio
Escoge leche baja en grasa o sin grasa, yogur y queso en tus comidas o refrigerios. Los lácteos contienen calcio para tener huesos fuertes y dientes sanos.
LECHE SIN GRASA
YOGUR
LECHE DE SOYA
Conoce tus alimentos "ocasionales." Cuidado con los alimentos con azúcares agregados o grasas sólidas. Te llenan de modo que ya no tendrás apetito para los alimentos que te ayudan a alimentarte bien y a jugar con ganas.

APPENDIX F:
Etapas del Dessarrollo, Educational Poster


Cuidar La Salud de los Niños
Etapas del Dessarrollo
Rango de Edad
Qué hacen
Qué precisan
Nacimiento a 3 meses
A esta edad los niños comienzan a sonreír, a seguir a personas y objetos con los ojos, a preferir rostros y colores brillantes, intentan alcanzar, descubren las manos y los pies, levantan la cabeza y rotan en dirección a los sonidos, y lloran, pero a menudo se calman cuando son alzados.
Protección contra peligros físicos, nutrición adecuada, cuidados de salud adecuados, (vacunas, terapia de rehidratación oral, higiene), estimulación motriz y sensorial, apropiada estimulación verbal, padres responsables y sensibles.
4 a 6 meses
A esta edad los niños sonríen frecuentemente, prefieren a padres y a hermanos mayores, repiten acciones con resultados interesantes, escuchan atentamente, responden cuando se les habla, sonríen, gorjean, imitan sonidos, exploran manos y pies, se ponen objetos en la boca, se sientan cuando son sostenidos, rolan, realizan movimientos rápidos, arrojan, toman objetos sin usar el pulgar.
Protección contra peligros físicos, nutrición adecuada, cuidados de salud adecuados, (vacunas, terapia de rehidratación oral, higiene), estimulación motriz y sensorial, apropiada estimulación verbal, padres responsables y sensibles.
7 a 12 meses
A esta edad los niños recuerdan acontecimientos simples, se identifican a sí mismos, partes del cuerpo, voces familiares, entienden su nombre, otras palabras cotidianas, expresan las primeras palabras significativas, exploran, golpean, sacuden objetos, ponen objetos en contenedores, se sientan solos, se arrastran, se estiran hasta levantarse, caminan, pueden parecer tímidos o alterados con personas extrañas.
Protección contra peligros físicos, nutrición adecuada, cuidados de salud adecuados, (vacunas, terapia de rehidratación oral, higiene), estimulación motora – motriz y sensorial, estimulación verbal apropiada, padres responsables y sensibles.
1 a 2 años
A esta edad los niños imitan acciones de los adultos, hablan y entienden palabras e ideas, disfrutan de historias y experimentando con objetos, caminan constantemente, suben escaleras, corren, afirman su independencia, pero prefieren personas con las que están familiarizados, reconocen la propiedad de objetos, desarrollan amistades, resuelven problemas, demuestran orgullo en sus realizaciones, gustan colaborar con tareas, comienzan con juegos de simulación.
Además de las necesidades de los años anteriores, los niños a esta edad precisan apoyo en lo siguiente: adquisición de habilidades motoras, verbales y de pensamiento, desenvolvimiento de independencia, aprendizaje de auto-control, oportunidades para jugar y explorar, jugar con otros niños. El cuidado de la salud deberá incluir también la eliminación de parásitos intestinales.
2 a 3 ½ años
A esta edad los niños disfrutan del aprendizaje de nuevas habilidades, incorporan lenguaje rápidamente, están siempre activos, pasan a controlar las manos y los dedos, se frustran fácilmente, actúan de manera más independiente, pero aún dependiente, representan escenas familiares.
Además de las necesidades de los años anteriores, los niños a esta edad precisan oportunidades para hacer lo siguiente: efectuar elecciones, participar en juegos de dramatizaciones, leer libros cada vez más complejos, cantar canciones favoritas, resolver rompecabezas sencillos.
3 ½ años a 5 años
A esta edad los niños tienen mayor extensión del tiempo de atención, actúan de manera tonta & bulliciosa, pueden utilizar palabras chocantes, hablan mucho, hacen muchas preguntas, desean cosas reales de los adultos, concretan proyectos de arte, prueban sus habilidades físicas y su coraje con precaución, revelan sentimientos en juegos dramáticos, gustan de jugar con amigos, no les gusta perder, compartir o alternar a veces.
Además de las necesidades de los años anteriores, los niños a esta edad precisan oportunidades para hacer lo siguiente: desarrollar habilidades motoras finas, continuar ampliando sus habilidades verbales a partir de conversaciones, lecturas y cantos, aprender cooperación ayudando a otros y compartiendo, experimentar con habilidades de pre-escritura y pre-lectura.
5 a 8 años
A esta edad los niños se vuelven cada vez más curiosos sobre las personas y sobre cómo funciona el mundo, demuestran un creciente interés por los números, las letras, la lectura y la escritura, tornándose cada vez más interesados en productos finales, adquieren más confianza en sus habilidades físicas, usan palabras para expresar sentimientos y competir, les gustan las actividades de adultos, se vuelven más sociables, juegan cooperativamente.
Además de las necesidades de los años anteriores, los niños a esta edad precisan oportunidades para hacer lo siguiente: desarrollar habilidades con números y lectura, intervenir en la resolución de problemas, realizar trabajos en equipo, desarrollar el sentido de la competencia personal, practicar el preguntar y el observar, adquirir habilidades básicas de la vida, asistir a la educación básica.

APPENDIX G:
Lavarse Las Manos, Educational Poster


Wash Your Hands!
¡Lávese Las Manos!
1 Wet Hands
Mójese las manos
2 Soap
Enjabónese
3 Wash for 20 seconds
Lávese las manos por 20 segundos
4 Rinse
Enjuáguese
5 Dry
Séquese las manos
6 Turn Off Water with Paper Towel
Cierre el grifo usando una toalla de papel
Nebraska Lincoln EXTENSION
Provided by University of Nebraska-Lincoln Extension in Lancaster County
and the Lincoln-Lancaster County Health Department
HEALTH DEPARTMENT

APPENDIX H:
Cuando Lavarse Las Manos, Educational Poster

¿Cuándo lavarse las manos?

Lavarse las manos en momentos claves del día.

1 **Al comienzo del día,** antes que lleguen los niños.

2 **Al finalizar** con la limpieza.

3 **Al regresar,** luego de haber estado jugando afuera.

4 **Antes y después** de preparar y comer alimentos.

5 **Luego** del cambio de pañales o de ir al baño.

6 **Después** de entrar en contacto con fluídos corporales.

7 **Luego** de tocar animales o sus pertenencias.

APPENDIX I:
Evite: Enfermedades del Agua, Educational Poster


EVITE
PRECAUCIÓN
PRECAUCIÓN PREC
Enfermedades del agua
Organización Panamericana de la Salud
Organización Mundial de la Salud
Américas
Alcanzar una vida saludable, mediante la promoción de estrategias orientadas a la reducción y manejo de riesgos, a la promoción de factores protectores de la salud, y del acceso con calidad y equidad a los servicios de salud son los grandes retos en los que la OPS/OMS basa su compromiso por la salud individual y colectiva.
Desinfección solar del agua
Un método para purificar el agua
1 FIJATE
Asegurate que sea un día soleado.
2 RECOGE
Una botella y llenala con agua.
3 ASOLEA
Deja la botella debajo del sol por 6 horas.
4 DISFRUTA
El agua está purificada y lista para beber.
Como funciona
Los rayos UV del sol matan casi todos los organismos biológicos en el agua. Este método no usa químicos peligrosos, es barata y ofrece una más o menos buena desinfección bacteriana y viral del agua.
Organización Panamericana de la Salud
Organización Mundial de la Salud
Américas
Alcanzar una vida saludable, mediante la promoción de estrategias orientadas a la reducción y manejo de riesgos, a la promoción de factores protectores de la salud, y del acceso con calidad y equidad a los servicios de salud son los grandes retos en los que la OPS/OMS basa su compromiso por la salud individual y colectiva.

APPENDIX J:
Invitation to Work with Corazon de Amor Health Clinic

Invitation to work at Corazon de Amor Clinic Research ×

amie bockstahler <amiebo@yahoo.com> Mon, Oct 8, 2018, 11:52 PM

to me

To whom it may concern:

Corazon de Amor Clinic in Guatemala City, Guatemala is extending an invitation to Jennifer Davidson and her fellow students to work with our clinic during March of 2019.

I am a missionary nurse working with Corazon de Amor Clinic and myself along with the rest of the clinic staff welcome Jennifer and the other students to complete their research/community service project with our clinic.

We are excited to have them serve alongside of us here in Guatemala!

Sincerely,
Amie Bockstahler, RN

Lastly, if you could send me a separate email saying the clinic has agreed to work with our group for our project that would be great. We just have to have a hard copy to print out to say we have "official" permission from the clinic to base our project there.

http://amiebockstahler.blogspot.com/ - visit my blog to read more about my journey to Guatemala!!!

"Significance is not found in the number of our days, but in what our eternal God says about how we have used them." -Mart De Haan
"El significado no es encontrado en el número de nuestros días, pero en lo que nuestro Dios eterno dice acerca de cómo nosotros los hemos utilizado." -Mart De Haan