

HEARING HEALTHCARE FOR CHILDREN IN DEVELOPING COUNTRIES: A
GLOBAL PERSPECTIVE

Capstone Project

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Abstract

Early identification and intervention of hearing loss is important in order to develop language skills during the critical period of language development. Universal newborn hearing screening programs have continued to grow in the United States and other developed countries as the standard care for early identification of hearing loss in infants. However, this program has not been widely implemented in developing countries. Hearing healthcare professionals are limited and resources are scarce in developing nations. This document provides an overview of hearing healthcare in developing nations, and presents the need for prevention, identification, and treatment of childhood hearing loss in these countries.

Dedication

I would like to dedicate this capstone document to my boyfriend, Kyle, for his invaluable patience and encouragement during graduate school and for the past 11 years. And to my mother, who has made many sacrifices throughout my life and instilled the importance of education and hard work. Thank you both for supporting me throughout my educational career.

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Chapter 1: Introduction

Permanent, bilateral hearing loss is estimated to be present in 3 to 4 per 1000 infants born in the United States, with many more having late onset of hearing impairment (Buchman, Adunka, Zdanski, & Pillsbury, 2011). Approximately 6 per 1000 babies are born with permanent hearing loss worldwide (Olusanya et al., 2007). Early identification and intervention of hearing loss has demonstrated significantly better language development than for those later identified. Language delays are apparent in all degrees of hearing loss from mild to profound. Early identification of hearing loss is important in order to develop language skills during the critical period of language acquisition (Moeller, 2000). Yoshinaga-Itano, Sedey, Coulter, and Mel (1998) found that those children identified with hearing loss and had intervention services before 6 months of age displayed better expressive and receptive language skills than those identified and had intervention services after 6 months of age. This advantage in language acquisition was found across all degrees of hearing loss. Auditory stimulation is the foundation for optimal speech and language skills in infants. The implementation of universal newborn hearing screening (UNHS) programs are designed to aid in early identification and intervention of hearing loss in newborns (Young, Reilly, & Burke, 2011).

Prior to the application of UNHS in the United States, only newborns at risk for hearing loss were screened for hearing impairment in the hospital. Infants at high risk for hearing impairment included those with a family history of congenital hearing loss, low

birth weight, craniofacial abnormalities, and congenital perinatal infection. Fifty to 70% of infants born with hearing impairment were missed due to these screening criteria (National Institute of Health [NIH], 1993). The Joint Committee on Infant Hearing (JCIH) was formed in 1969 with the goals of early identification of children with or at risk of hearing loss and employment of UNHS programs. In 1994, the Committee endorsed universal detection of hearing loss in newborns by recommending that infants be screened before hospital discharge. They indicated that newborns should be identified by 3 months of age, and receive appropriate intervention by 6 months of age. In 2000, the JCIH employed guidelines for hospitals and state UNHS programs for screening, follow-up diagnosis, and intervention services. They indicated that newborns should be screened by 1 month of age, have audiologic evaluation by 3 months of age, and be enrolled in intervention by 6 months of age. Benchmarks and quality indicators were also put in place to monitor program performance and for improvement of UNHS programs (Joint Committee on Infant Hearing [JCIH], 2007).

Currently, the protocols of the JCIH (2007) indicate that all newborns should be screened using the two-step process. The two-step screening involves either an OAE or ABR screening before discharge from the hospital. If an infant fails either screening, then the infant should be screened using the method not used in order to validate the results (JCIH, 2007; NIH, 1993). There has been great progress in the United States and other developed countries such as Australia and the United Kingdom to have infants screened for hearing loss by 1 month, diagnosed by 3 months, and intervention by 6 months. The introduction of UNHS programs in the developing world are being implemented; unfortunately, the progress has been much slower than programs in developed countries

(Swanepoel, Louw, & Hugo, 2007). Hearing healthcare professionals are limited in developing nations, and assessment equipment and amplification are unaffordable for most in these communities. However, organizations are taking steps to control preventable hearing loss and provide hearing healthcare services (McPherson & Brouillette, 2008).

The main purpose of this capstone document was to examine hearing healthcare for children in developing countries. This document highlights hearing impairment, cultural views, and rehabilitation for hearing loss in developing countries. Lastly, it provides an overview of the future of hearing healthcare programs and the need for prevention, identification, and treatment of hearing loss among the world's developing countries.

Chapter 2: Hearing Healthcare in Developing Countries

Developing countries have many different features including a greater rural population, less ethnically homogenous, more linguistically diverse, and have greater income inequality than those individuals who live in a developed country (McPherson, 2008). McPherson (2008) describes developing countries as those with low average annual income where the economy is driven by agriculture and primary resources. They also do not have a strong industrial component and often rely on aid from other developed nations. Other descriptions of developing countries include “less developed countries”, “developing nations”, “emerging nations”, “the South”, and “underdeveloped countries” (McPherson, 2008).

Asia, Africa, the Middle East, Latin America, and the Pacific consist of developing countries. The World Bank categorizes countries into groups by gross national income per capita. A country is considered a developing country if their average annual income is less than \$10,065 (USD) per person. There are more than 100 countries classified as low income or developing including India, Pakistan, Mexico, Cuba, Columbia, Nicaragua, Costa Rica, Jamaica, Saudi Arabia, and Nigeria (Tucci, Merson, & Wilson, 2009; World Bank, 2006).

Audiology continues to advance in the developed or industrialized world by providing individuals with hearing impairment proper screening, diagnostic assessment, hearing aid fitting, and rehabilitation. This is not true for developing countries, where

many children with hearing loss go undetected and audiologists are limited (McPherson & Brouillette, 2008). Most audiologists are trained, live, and work in developed countries where there is advanced healthcare technology available. There is a shortage of audiologists worldwide related to the lack of government funding for hearing healthcare, lack of awareness of the profession, lack of awareness about hearing, and lack of audiology educational programs (Goulios & Patuzzi, 2008). More audiologists are beginning to work in developing nations and establishing hearing healthcare programs. Patricia Castellanos de Munoz, for example, received her training in the United States and moved to Guatemala to establish an audiological institution with the help of three ear, nose, and throat physicians. Prior to the start of the program, audiology was yet to be developed in Guatemala (Castellanos de Munoz & Sosa, 2008). Some countries such as Africa and India have a combination of speech language pathology and audiology programs. The future direction of audiology is to become a more autonomous occupation separate from speech language pathology in developing countries. One issue with audiology programs in developing nations is that there is a variation in education. There are university programs, but also vocational or technical training programs. These audiology programs do not have the standardization like those in the United States (Basavaraj, 2008; Goulios & Patuzzi, 2008; Swanepoel, 2006).

Technicians, nurses, and other healthcare providers provide hearing services to the people in developing countries. Hearing healthcare can be found in more urban than rural areas of these countries (Swanepoel et al., 2007). There are hearing aid technicians who are trained to service and repair amplification devices (McPherson & Brouillette, 2004). In countries such as India, a hearing aid license is not required. Hearing aid

dispensing and services are provided by ear, nose, and throat physicians, pediatricians, audiologists, speech language pathologists, special educators, opticians, pharmacists, and grocers (Basavaraj, 2008).

Hearing loss is not the highest priority for individuals in developing countries who have other health issues, such as life threatening illnesses or diseases (McPherson, 2008). There are different health conditions between developed and developing nations. Developing countries have many life threatening diseases and a shorter life expectancy due to nutritional deficiencies and poor maternal and prenatal care. Developing nations rely on aid and assistance from industrialized economies to meet many healthcare needs. Priority is designated to fatal health conditions, especially those that are preventable such as malaria, tuberculosis, HIV/AIDS, and measles. Disabilities are often neglected due to their cost effectiveness. For example, hearing impairment requires expensive rehabilitation options so it is overlooked (Olusanya, 2007). These issues make it more difficult for audiologists trained in developed countries to work in less developed countries.

The population in developing countries is growing rapidly, whereas the population in developed countries is declining (McPherson, 2008). The rapid growth of the population in developing nations also means an increase in the number of children born with disabilities. These global demographic changes will further shift the burden of those with disabilities such as hearing loss to those living in developed countries (McPherson, 2008; Tucci et al., 2009). Two to 4 per 1000 (28,000) infants in developed countries are diagnosed with permanent hearing loss at birth, compared to 6 per 1000 (737,000) in developing countries. Resources to treat disabilities such as hearing loss in

developing countries are not increasing proportionately to the growing population (Tucci et al., 2009). Poverty, poor healthcare systems, and unstable government leadership hinder progression in developing countries (Olusanya, 2005b).

The World Health Organization (WHO) defines a disabling hearing impairment as a hearing loss greater than or equal to 40 dB HL. Permanent hearing impairment is due to genetic or environmental factors, however, the majority of hearing impairments in developing countries are preventable. (Olusanya et al., 2007; Olusanya, 2012). Otitis media, other middle ear pathologies, and cerumen impactions are the most common preventable causes of hearing loss in developing countries, which typically go untreated therefore leading to a life-long hearing impairment (Kumar, 2001; Olusanya, Luxon, & Wirz, 2005a; Olusanya, 2012). There are also preventable sensorineural hearing losses including genetic hearing losses associated with consanguinity, ototoxic drugs, noise exposure, and poor prenatal pregnancy care. Hearing loss caused by infections such as measles, mumps, rubella, and meningitis are also preventable if people are properly vaccinated (Olusanya et al., 2005a; Olusanya, 2012; Tucci et al., 2009). The prevention of hearing impairment is considered the main goal for hearing healthcare policy, but that does not address the needs of individuals with congenital hearing loss (Olusanya, 2012).

Prevention of hearing loss is considered to be of great importance in developing countries due to lack of resources and hearing healthcare providers. Socioeconomic and healthcare conditions in developing countries do not aid in the prevention of congenital hearing impairment. Immunizations, health education, and improved maternal and child health services are ways to help prevent environmental causes of hearing loss in developing countries (Olusanya et al., 2007).

Chapter 3: UNHS & EDHI

All age groups, especially children, often go undetected for hearing loss in developing countries. Families in developing nations face many obstacles, such as poverty and limited health care, living, and educational services. A child with hearing impairment is an added challenge for these families. It is difficult for parents to identify signs of hearing loss in children in a timely manner, and then to be committed to the rehabilitation process (Castellanos de Munoz & Sosa, 2008). Hearing loss is not a life threatening condition, however, early identification and intervention of hearing loss has demonstrated significantly better speech and language development than those later identified (Moeller, 2000). UNHS programs have been established as a standard of care for infants in developed countries such as the United States, United Kingdom, Australia, and Poland. Developing countries are beginning to implement UNHS and rehabilitation programs to address childhood hearing loss; unfortunately, the progress has been slower than for programs in developed countries (Swanepoel et al., 2007).

There is a combination of barriers to employing the program in developing countries, with a chief issue being funding for UNHS programs. Hearing loss is a silent epidemic, which often goes unnoticed in developing countries (Olusanya, 2011; Swanepoel et al., 2007). Childhood hearing loss is not the current priority in global health, but progress is being made for hearing screening and intervention services in

developing countries (Olusanya et al., 2007). The shortage of financial resources is another barrier for developing countries to implement a UNHS program comparable to those in the United States or Australia. Diagnostic equipment is expensive, and developing a national hearing screening program would need to be backed by international support (McPherson, 2008; Olusanya, 2012). A non-life threatening condition such as hearing loss is often neglected in developing countries. Life threatening conditions are perceived as a higher priority than hearing loss. Many developing countries do not have the resources available to provide for screening and intervention services such as hearing aids or cochlear implants for children with hearing loss. Due to the implications of hearing loss on a child's speech and language development, there is a growing need for screening, identification, and intervention services in developing countries. (Olusanya, 2012; Tucci et al., 2009).

In 1995, the World Health Assembly urged all countries to prevent and control hearing loss by supporting early detection of hearing impairment in infants and children (World Health Organization [WHO], 1995). However, they did not propose methods to achieve this goal. Currently, developed countries have introduced hearing screening prior to hospital discharge, but developing countries have been slower in addressing the importance of identifying hearing impairment in children in a timely manner (Olusanya, 2011; Tucci et al., 2007). Some developing countries have introduced hospital, community based, and targeted hearing screening programs (McPherson & Olusanya, 2008). In 2007, Guatemala initiated a newborn hearing-screening program. Prior to this, many children were not diagnosed with hearing loss until 3 to 6 years of age (Castellanos & Sosa, 2008).

Hospital, community based, and targeted hearing screenings are options for how UNHS and intervention programs could be provided in developing nations. Infants need to be eligible shortly after birth in order for early detection. Hospital screening programs are the most desirable because the newborn is available directly after birth, and mothers do not have to return to have their infant tested (McPherson & Olusanya, 2008; Swanepoel et al., 2007). However, the majority of births in developing countries do not occur in a hospital or conventional health facility. Most newborns are born at home or private maternity homes. For example in South Asia hospital deliveries account for only 13% of births (McPherson & Olusanya, 2008). For this reason, basic healthcare services such as immunizations are provided at community healthcare clinics, instead of larger hospitals (Swanepoel et al., 2007). A combination of both community based hearing screening programs and hospital programs have been proposed to these countries where there is not access to the newborn shortly after birth (Olusanya, 2012). Targeted newborn hearing screenings is another option and a good starting point for developing countries implementing UNHS. The United States first began UNHS with targeted hearing screenings. Infants born with risk factors for hearing loss such as low birth weight, family history of hearing loss, or craniofacial abnormalities would be screened before discharge from the hospital (McPherson & Olusanya, 2008; NIH, 1993).

Universal newborn hearing screenings are provided by universal health care programs or covered by third party health insurance in many developed countries, which highlights the belief that screenings should be government funded for developing countries. Many developing countries do not have the resources to fund UNHS when there is a higher priority for financing life threatening diseases. One issue is that hearing

impairment is not recognized as a significant health condition, which further reduces the likelihood of publicly funded UNHS program. Due to the limitations of resources, funding is reserved for sustaining health programs instead of providing additional services (Olusanya et al., 2000).

The lack of audiologists and hearing healthcare professionals is another issue for developing nations. Trained technicians can perform hearing screenings, but they do not have the skills of audiologists to provide amplification for individuals with hearing loss. Even if infants are diagnosed with hearing loss, the next hurdle for families is providing them with rehabilitation options (Olusanya & McPherson, 2008).

Chapter 4: Cultural Issues

Hearing loss is one of the most common causes of disability in low-income, developing countries (McPherson, 2012). “Childlessness is better than being saddled with an abnormal child” is a Nigerian saying that reflects the attitude they and other developing countries hold towards children with disabilities (Odebiyi & Togonu-Bickersteth, 1987). Children with hearing loss or some other developmental disabilities can face discrimination, malnourishment, physical abuse, and restricted access to social services (McPherson, 2012). The majority of current knowledge of parental views and attitudes on infant hearing loss in developing countries is from South Africa. Unfortunately there is little research on cultural sensitivities of hearing loss in other developing nations. In order for newborn hearing screenings to succeed, it is important to understand the parental and cultural views of childhood hearing impairment to help facilitate the acceptance of hearing loss.

In many developing countries, individuals have widely held superstitious beliefs. They often attribute permanent congenital hearing loss to supernatural causes (de Andrade & Ross, 2005; McPherson, 2012). Individuals populating the developing countries of South Africa often consult traditional healers along with western trained health care practitioners to treat hearing loss. Healers are held at high prestige and serve as priests, herbalists, advisors, and psychiatrists. There are different views between traditional and modern culture, which shapes individual’s perceptions on all matters, even

healthcare. Modern medicine focuses on the individual, whereas traditional medicine focuses on the family, social, and cultural factors (de Andrade & Ross, 2005). In South Africa, traditional healers are sought out to treat many audiologic and otologic related conditions including tinnitus, ear pain, ear discharge, and hearing loss. Healers hold different viewpoints as to the cause and treatment of hearing loss. The most common viewpoints of healers as to the cause of hearing loss include ancestors, noise, congenital factors, poor aural hygiene, and bewitchment. The laying of hands is the most common treatment for hearing loss used by South African healers (de Andrade & Ross, 2005).

Consanguinity is a cultural tradition still practiced in Africa, Asia, and Latin America. It is when two individuals share a common ancestor and is dictated by religious and cultural beliefs. While it is not common in the United States and many developed countries and in fact it is illegal in some of these countries, it is still common in traditional developing countries. Saudi Arabia still practices consanguinity due to the social customs of the country. Arranged marriages are common in this country, and the adverse effect of reproduction with a relative is unknown to these individuals. It is tradition in Saudi Arabia to have large families and rapid growth within the family. Pregnancies that result from consanguineous relationships can result in autosomal recessive diseases, including hearing impairment (Zakzouk, 2002). Zakzouk (2002) found significance in hereditary childhood hearing loss of children whose parents are in consanguineous marriages. Prevention is the only way to reduce the amount of children born with genetic hearing loss due to consanguinity. Individuals who continue to practice consanguinity are not educated on the possible health risks as a result of reproducing with

a common ancestor. Health education may help reduce the number of children born with genetic hearing impairment (Zakzouk, 2002).

Most individuals living in developing countries are not educated about hearing loss, which often leads to discrimination of those who are hearing impaired. Cultural attitudes towards hearing loss and deafness in deprived African societies range from acceptance to rejection. In some extreme cases, childhood hearing loss has led to infanticide. Many families in Africa reported that they experience shame over their child's hearing loss (Kiyaga & Moores, 2003). Shame over an individual's hearing loss can be attributed to the additional strain on a family. If the family member is unable to work due to the hearing loss, then they are considered a financial burden (Stephens, Stephens, & Eisenhart-Rothe, 2000).

African's traditional beliefs of the causes of permanent hearing loss are related to mysterious fate and God's will. An example of this is in Rwanda, people who are deaf or hearing impaired do not have access to schooling, employment, and live in poverty (Kiyaga & Moores, 2003). In Nigeria, the family is blamed for a child's hearing loss. Hearing impairment is viewed as a punishment for the sins committed by the parents or earlier generations. Parents try to hide the condition in order to hide the evidence of sin. Others in Tanzania believe that hearing loss is contagious. Some female teachers are fearful of their own children being born with hearing loss, so they refuse to teach deaf students (Stephens et al., 2000).

In China, parents of children with hearing loss tend to have a negative attitude towards hearing impairment. Some of this stems from the pressure to only have one child and the idea that the only child should be perfect. If a disability is not due to genetic

causes, then parents are allowed to have a second child. Parents often try everything including acupuncture and herbalists to find a cure for their child's hearing loss. Parents also isolate their child from social activities for fear of discrimination. Many children who are deaf or hearing impaired are sent to residential schools and are kept away from their homes and families. Children in residential schools are also isolated from outsiders and are not permitted to attend events outside of school. The thought behind this is to protect children from facing discrimination because of their hearing impairment (Li & Prevatt, 2010; Stephens et al., 2000).

Cultural sensitivities of families in developing nations dictate whether parents take their newborn to the hospital for hearing screening. Parents of children in developing nations believe that taking a child to a hospital is culturally and socially inappropriate. These individuals view hospitals as catering to the sick, not to the healthy. Many births occur in local birthing centers or at home instead of local hospitals. Screening infants in the hospital shortly after birth eliminates the need for parents to return to the hospital to have their infant tested, and fulfills the ethical obligation of confirming that a child does not have a hearing impairment prior to discharge (McPherson & Olusanya, 2008).

Some cultures, such as those living in Guatemala believe appearances should be maintained. Along with lack of health education, they tend not to accept hearing impairment or the use of amplification to improve their quality of life. They often have misconceptions about hearing loss and other disabilities, and do not want to stray from cultural norms. It is also common for Guatemalans living in poverty to sell donated hearing aids to meet their other financial needs. They do not value the services offered to them because they are unaware and uneducated (Castellanos & Sosa, 2008).

Parental knowledge and attitudes towards hearing loss in children is important in order to have successful UNHS and EHDI programs. Not only is hearing impairment not acceptable in some cultures, but neither are hearing aids and cochlear implants. Parents may opt to have children be nonverbal and learn sign language instead of being fit with amplification. Some parents of children in developing countries view hearing aids negatively due to the associated stigma, which results in children not using them (Olusanya, 2012).

Despite the stigma attached to disabilities and hearing impairment, a recent study by Olusanya, Luxon, and Wirz (2006) found that maternal acceptance of neonatal hearing screening was 92% in Nigeria (Olusanya et al., 2006). Mothers were asked to respond to a questionnaire about their knowledge and acceptance of hearing loss. Mothers in this study had a favorable attitude of neonatal screenings and high acceptance of hearing aids, and even more so if they were provided free. Mothers also showed significant awareness and knowledge of hearing loss. This is encouraging considering the stigma of childhood disabilities in developing countries. Most mothers did not know or were not sure the causes of hearing loss (Olusanya, 2006). Governmental and international funding in Nigeria helps to educate mothers on immunizations, so this could be a way to educate parents about hearing loss and treatment options. The favorable attitude of parents towards hearing impairment shows the readiness for hearing screenings in developing countries (Olusanya, 2006; Swanepoel & Almec, 2008). Attitudes towards hearing loss in developing countries depend on socioeconomic conditions, lack of understanding or education, and beliefs of the origin of hearing loss.

Chapter 5: Amplification

Audiologists working in developed countries, such as the United States, have access to the most sophisticated diagnostic equipment and rehabilitation options for patients. These audiologists also have their choice in the selection of innovative digital hearing aids, cochlear implants, and FM systems for patients with hearing loss. Hearing technology continues to advance and manufacturers of hearing aids are able to do so because of the high volume of sales in developed countries (McPherson, 2011). This is not the case in developing countries where access to resources for diagnosing and treating hearing loss are limited (McPherson & Brouillette, 2004). According to Sanjay Kumar (2001), 250 million people of the world's population have hearing loss, and two-thirds of them live in a developing country. The World Health Organization (WHO) has estimated that developing countries need 32 million hearing aids per year, but only receive around three-quarters of a million a year. The population in developing countries continues to grow at a faster rate than in developed countries, which translates into a growing necessity for rehabilitation options (Kumar, 2001; McPherson, 2011). There is an obvious need for rehabilitation in developing countries, but there are many barriers to achieving this goal.

Hearing healthcare professionals and equipment are scarce in developing countries, but once individuals are diagnosed with hearing loss the next obstacle is the cost of hearing aids (McPherson & Brouillette, 2004; McPherson, 2011). Families in

developing nations are faced with many financial obstacles, without considering the financial needs of a child with disabilities. Parents are hardly able to gather the finances for the diagnoses of hearing loss, let alone the cost of hearing aids and hearing aid services (Castellanos de Munoz & Sosa, 2008). One hearing aid can retail up to \$3000 or more in the United States and developed countries. Hearing aid manufacturers concentrate on products that are marketed in developed countries because of their high purchasing value. The WHO has established hearing aid guidelines for services in developing countries. They recommend that hearing aids available should be distributed to children first, and then the remaining available hearing aids should go to adults (Tucci et al., 2009). The WHO also established the affordability of hearing aids, and they require that the price is dependent upon the average income in each country. The guideline states that hearing aid price cannot be more than 3% of gross national product (GNP) per capita. (Brouillette, 2008). Patients may pay between \$200 and \$500 depending on the level of technology for a hearing aid in developing countries. The WHO guideline on hearing aid price is hard to meet in developing nations with the technology and hearing aids available (Brouillette, 2008; McPherson & Brouillette, 2004; McPherson, 2011). Import tax is high and that also increases the cost of hearing aids sold in developing countries (Brouillette, 2008). Hearing aid manufacturers mark up hearing aids to almost 10 times its manufacturing cost. In India, programs within the country are dispensing hearing aids at reduced costs. This allows for individuals to purchase quality hearing aids at a reduced price (Basavaraj, 2008). Even if hearing aids are provided at no cost to individuals it does not mean that they will be used. For example, in Guatemala individuals sell donated hearing aids. Individuals living in poverty have to meet financial needs like food, shelter,

and taking care of their families. They do not value the services offered to them because they are unaware or uneducated (Castellanos de Munoz, & Sosa, 2008). Some parents in developing countries do not make their child wear donated hearing aids because of the associated stigma attached to hearing impairment (Olusanya, 2012). Amplification will not be a high priority for many individuals in developing nations until they are properly educated about hearing loss (Castellanos de Munoz, & Sosa, 2008).

Hearing aid cost is not the only barrier for hearing impaired patients in developing countries. The maintenance of hearing aids once they are available to the patient also serves as an issue. The annual cost of zinc air hearing aid batteries is \$36, and the majority of people in low-income developing countries like Nigeria or Nicaragua live on less than \$825 (USD) a year (McPherson & Brouillette, 2004; Tucci et al., 2009; WB, 2006). Hearing aid batteries are also not always available in local markets, which is a difficulty for those families who can afford them (McPherson & Brouillette, 2004). Solar powered hearing aids or rechargeable hearing aid batteries are also an option when batteries are not readily available (Brouillette, 2008; McPherson & Brouillette, 2004).

Audiologists are limited in developing countries. Many do travel and provide volunteer work, but not in all rural areas of developing countries. In larger, urban areas of developing countries, audiologists, audiology technicians, and speech pathologists are partnering up to deliver assessment and rehabilitation services to patients. Technicians are trained to service and repair amplification devices (McPherson & Brouillette, 2004). India does not require a hearing aid license, so ear, nose, and throat physicians, pediatricians, audiologists, speech language pathologists, special educators, opticians, pharmacists, and grocers may dispense hearing aids. It is common for individuals with

hearing impairment in India to be fit with hearing aids without having an audiologic assessment (Basavaraj, 2008).

The WHO has recently collaborated with hearing aid manufacturers and charities to aid in reducing cost and providing hearing aids to people with hearing loss in developing countries. They have encouraged organizations to deliver hearing aid technology to developing countries at a reasonable price. (Kumar, 2001; McPherson & Brouillette, 2004). The Godisa project, is an example of a not-for-profit company that has made hearing aids more affordable and appropriate for individuals with hearing loss in developing countries. Godisa recognized the faults in hearing aid and services in developing countries including cost of hearing aids and batteries, lack of availability of batteries, the non-robust design of hearing aids, and the poor electroacoustic design. They market European designed behind the ear hearing aids with a solar rechargeable battery that can be recharged on an external solar-panel unit. This project is mainly in South Africa, but expanding to other developing countries. Large hearing aid manufacturers in developed countries are also providing entry- level hearing aids at comparable prices (McPherson & Brouillette, 2004; McPherson, 2011). The Starkey Foundation is one manufacturer that donates more than 20,000 hearing aids to developing nations annually (Tucci et al., 2009).

Olusanya (2004) found that once hearing aids are available to patients in developing countries with hearing loss, then self-reported rehabilitation outcomes are comparable to those individuals with hearing loss in developed countries. Individuals with hearing loss in Nigeria were fit with hearing aids and reported an improvement in quality of life individually and for their significant other. It was also found that hearing

aids improved the activity level of the respondents (Olusanya, 2004).

The Convention on the Rights of Persons with Disabilities has recognized that access to assistive technology is a right of individuals with hearing impairment (Borg, Lindstrom, & Larsson, 2009). Initiatives are currently in progress to provide hearing impaired individuals in developing countries with rehabilitation. Given the increasing population in developing countries, there is an urgent need to provide these individuals with rehabilitation options. Research in the area of affordable hearing aid technology and the application of hearing healthcare into developing countries needs to be considered.

Chapter 6: Global Initiatives and Future Direction

The United Nations Millennium Declaration and the WHO initiatives are two global developments that will impact the field of audiology in developing countries. The United Nations declared in 2000 to improve overall health and welfare in developing nations by 2015. Goals affecting hearing loss include improving immunizations, maternal health, and disease in developing nations. The WHO has also committed to aid in avoiding preventable hearing loss, such as hearing impairment caused by otitis media, and supporting developing countries (McPherson, 2008). They encouraged all countries to take steps in order to control avoidable hearing loss, and for early detection of hearing loss in children. The WHO has also established hearing aid guidelines for the affordability of hearing aids in developing countries. They recommend that the cost of hearing aids be based on the average income per country (Brouillette, 2008).

UNHS programs in developing countries are not advancing as fast as those in developed countries. Alternative approaches to UNHS programs may be helpful until resources become available to better implement these programs in developing nations. One option to better meet the needs of developing countries are to consider targeted or community based hearing screening rather than universal hearing screening. This was first adapted in developed countries as part of pilot hearing screening programs. High risk factors including low birth weight, craniofacial anomalies, and family history of hearing loss put infants at higher risk for hearing impairment. Targeted screening is more realistic

for developing nations, and could be used until resources are available for universal screenings (McPherson, 2012).

Community based hearing screenings in developing countries can also be considered. The majority of births in developing countries do not occur in hospitals, so screenings in community centers can ensure all newborns are being screened. Linking community based hearing screenings to immunization clinics is a good option and provides an opportunity for newborns to be screened when they receive their immunizations. Swanepoel, Hugo, and Louw (2005) found that providing hearing screening at a community based clinic in South Africa proved to be successful. One major barrier was follow-up rates, which is also the largest barrier in the United States and other developed countries. (McPherson, 2012; Swanepoel et al., 2005; Swanepoel, 2007).

Tele-audiology is currently being introduced in many countries outside of the United States. A pilot project for EDHI through the Children's Hospital of Colorado has recently been introduced in Guam. Guam has a successful UNHS program, but they lack audiologists with experience in infant diagnostic evaluations. Tele-audiology is a good alternative for those countries that do not have the availability of hearing healthcare professionals. Infant diagnostic evaluations using tele-audiology can make diagnosis by three months of age achievable (Hayes, 2012). Educating parents on childhood hearing loss is essential in order to have a successful hearing-screening program. This is especially important in developing countries where there is a stigma attached to hearing impairment. Parental support is important for the success of UNHS and EHDI programs. Poor parental compliance of these programs in developing countries due to cultural

beliefs of disabilities and knowledge of hearing loss shows that parents need to be more educated for these programs to be successful (Swanepoel & Almec, 2008). In order for parents in developing countries to become more accepting of hearing loss, hearing aids, and cochlear implants, they must be properly educated on the effects of hearing loss. Cochlear implants and hearing aids are expensive, therefore, it is an obstacle for those in low-income countries. Intervention services for cochlear implants must also be supported by postimplant services. This is also true for hearing aids. There must be subsequent services to optimize the child's speech and language skills (Olusanya, 2012).

It is essential that pediatricians in developing countries are supportive of UNHS programs and childhood hearing impairment. This may require some education on these programs and the effect hearing loss has on speech and language development.

Pediatricians are positioned to promote hearing screenings, but are not able to without the proper education. Newborn hearing screening should be viewed as a component of neonatal examination prior to discharge from the hospital. High-risk infants should be promptly referred for hearing screening since they are also at risk for hearing loss (Olusanya, 2012).

Chapter 7: Conclusion

This capstone document provided an overview of the current and future implications of hearing healthcare for children in developing countries. Early identification and intervention of hearing loss is important for optimal speech and language development. There are numerous barriers to hearing healthcare in developing countries including limited audiologists or hearing healthcare professionals, lack of financial resources, and cultural sensitivities. Audiological services needed in developing countries in order to provide adequate hearing services are personnel, diagnostic equipment, and amplification devices. There are economical, social, political, and health differences between developing and developed countries, which is a large barrier for audiologists providing services to developing nations.

Currently, there is not a lot of research in the area of hearing healthcare in developing countries. Awareness is essential to help provide underserved countries with better healthcare opportunities. UNHS and hearing healthcare for children may not be feasible in all developing countries, but steps can be made until resources are available. Low public awareness, lack of resources and government support hinder the progress towards UNHS and rehabilitation. However, developed countries such as the United States had the same barriers prior to the implementation of the universal screening program. Recognition and hearing loss education must be made of value to early detection and intervention of hearing impairment for a successful UNHS and hearing

programs in developing countries. The future of hearing healthcare and education on this silent epidemic in developing countries is imperative in order to improve the quality of life for these individuals.

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