



12-5-2014

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## Recommended Citation

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Use of mobility devices in developing countries; a comparative literature review introducing the contextual factors surrounding accessibility and the use of mobility devices in Ghana, Bangladesh, and Guatemala.

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Lee Honors Thesis December 5, 2014

**Abstract:** Disability in the developing world encompasses 10% of the global population and much of that population requires the use of a mobility device in order to engage in meaningful occupation. The use and accessibility of mobility devices is shaped by the significance of the barriers surrounding mobility. This research looks comparatively at the factors affecting accessibility and the use of mobility devices in three developing countries; Ghana, Bangladesh, and Guatemala. Trends within literature revealed that economic, environmental, and cultural barriers all had an impact on accessibility. Overall, this study determines that accessibility solutions are not possible without removing barriers to the obtainment and functional use of mobility devices both in the home and community.

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## Introduction

Inspiration to research mobility device accessibility in developing countries followed a trip to Guatemala where I worked as a seating technician alongside a team of therapists, mechanics, and interpreters. As I thought about the difference between accessibility in the United States of America (USA) and Guatemala, I realized that the culture of the country had such a large impact on persons with disabilities using wheeled mobility, and the cultural effects ranged from community accessibility to stigma. In addition to gaining cultural knowledge, I was able to provide a service while working in tandem with Guatemalan professionals. Communities could may benefit from having a more open cultural acceptance of people with mobility limitations, a better understanding of the factors and barriers for personal mobility device use, more well trained rehabilitation seating professionals, and financial support towards the purchase of more mobility devices or device repairs with the goal of increasing functional mobility among individuals with disabilities.

In the last several years, I have been blessed with opportunities to travel internationally and have had experiences in both the Western world and developing nations. As an occupational therapy student, I tend to observe with a clinical eye and have noticed large discrepancies of mobility accessibility between countries. In Freiberg, Germany, public transportation was modeled using a universal design concept of zero step entry- the trams generally stopped at points which were flush with the sidewalk allowing wheelchair users to safely and easily access their community. The Metro system in Paris, France presented a challenge for individuals with disabilities because of the crowded nature of the train and very short window of time that the doors open at each stop. The airport and transportation station in Zurich, Switzerland had few physical barriers to the entrances for people utilizing mobility devices, however, many of the old town roads were cobblestone and at steep angles. When visiting Guatemala, I noticed that many individuals with disabilities who may benefit from the use of mobility device or were current device users would have difficulty accessing their homes and community with or without this technology. Variances in culture and awareness of disability and financial resources seem to shape how a country provides mobility devices and accessible communities for individuals with mobility disabilities.

The goal of this thesis is to explore the similarities and differences between how people who have mobility limitations in three targeted countries get around in their communities, and how these conditions are similar or different in these countries from the United States and other developed countries. Thesis will be compiled from literary research supplemented by interviews with medical professionals specializing in rehabilitation services who have relevant international experience. The three countries- Ghana, Bangladesh, and Guatemala- were chosen based on strong cultural differences and the availability of information on those countries from literature and personal connections.

### *Overview*

According to the World Health Organization, 15% of the world population has one or more disability and 80% of individuals with disabilities are living in developing countries. Developing nations are typically characterized by unstable governments, the absence of middle class, high rates of disease, above average percentage of adult illiteracy, high infant mortality, high poverty level, less industrialized society, and economic dependence (World Health Organization, n.d.). Disability rates in developing countries tends to be higher because of circumstances such as malnutrition, lower access to safe environment including drinking water and sanitation, poor or non-existent health care, lack of rehabilitation services (Saetermoe et al, 2004). The factors that contribute to being categorized as a developing nation are the same factors that create barriers for the large population of individuals with disabilities; there is a

higher prevalence of disability and a lack of ability to support this population due to economic, societal, and environmental factors. These barriers create challenges when countries searching for solutions to increase ambulation and mobility for individuals with physical disabilities. Because disability is widespread throughout the global population, mobility becomes an essential need that may only be available through some sort of technology. There are however, many challenges regarding the acquisition of mobility devices within developing nations and once those mobility devices are obtained, will the community and home be accessible?

The World Health Organization states that a wheelchair or personal mobility device is an assistive device for an individual with a walking limitation and is designed to improve personal mobility and facilitate participation in functional and meaningful activities (Sheldon & Jacobs, 2007). Only 5-15% of the developing world population can access assistive devices. The purpose of this paper to is examine the factors contributing to the need and functional use of mobility devices in three geographically and culturally different developing countries- Ghana, Bangladesh, and Guatemala.

### *Methods*

The method used is a comparative study of the use of personal mobility devices and community accessibility between the United States of America and developing countries. Countries highlighted include Ghana, Bangladesh, and Guatemala. The goal is introduce the general use of mobility devices in these countries and to highlight the barriers related to accessibility, whether these barriers are a result of poor governmental action, cultural stigma, or environmental factors.

#### I. Apparatus and materials

Modes of research include electronic databases, interviews with experienced occupational therapy professionals, and personal accounts from missions work in Guatemala.

A literature search was conducted using the following electronic databases; Elsevier, Embase, Informa Healthcare, Proquest, and PubMed. In addition to database search, research was gathered by citation searches in reference lists, academic text review, and interviews (phone and in person) with rehabilitative professionals who have relevant international experience.

#### II. Procedure

Study was designed to be a literature review in order to comparatively address the use of personal mobility devices in developing countries and their accessibility solutions. The

implementation of a comparison between the United States and the developing countries targeted is intended to show pros and cons of accessibility for Western culture as well as the developing world. Due to a shortage of literature pertaining to the topic of study, the scholarly research was supplemented with interviews from two occupational professionals with experiences in Ghana and Bangladesh. My own personal experience supplemented the literature available for Guatemala. Interviews and database research was completed simultaneously and between May and November 2014.

### *Importance of proper mobility device selection and fit*

The standards for device fit and use vary based on the needs of a population and defined norms within a country. However the universal principle remains the same; mobility devices are complex forms of technology, and rehabilitation specialists need to have some form of clinical training and theoretical study prior to assessing and fitting individuals (Bolding et. al., 2013). Additionally professionals need to have a knowledge of the needs and cultural beliefs of the population. For wheelchairs specifically, there are many factors regarding durability and usability for the environment in addition to concerns about personal fit that optimally go into the final recommendation for a mobility device. Poor fitting wheelchairs can cause complications that include tissue breakdown and pressure sores, reduced performance, deformities or contractions, urinary and respiratory infection, and fatigue. United States seating standards include that mobility device fit should normalize tone, maintain anatomical alignment, promote comfort and relaxation, facilitate normal movement patterns, prevent or decrease the risk for pressure sores, decrease fatigue, and facilitate maximum function with minimum pathology (Jones & Gray, 2005). Therapy and healthcare professionals in the USA feel that wheelchairs should be an extension of a person's body and facilitate good body alignment, mobility, and function within a community (Bolding et. al., 2013).

### *United States of America mobility accessibility standards*

Prior to comparing the use and accessibility of mobility devices in developing countries, I examined the standards for the United States of America- this is by no means a measure of comparison for perfect mobility access, the USA was chosen because it is a familiar developed nation. The primary source of legislation outlining USA accessibility standards is the American's with Disabilities Act (ADA). The legislation ensures accommodations for accessibility for the use of personal mobility devices such as manual and power wheelchairs, scooters, walkers, canes, and crutches. These accessibility standards not only allow for physical

inclusion for individuals with disabilities, but it also opens up the community for universal access to services and employment.

Employment accessibility outlined by ADA requires that employers make reasonable accommodations, unless it causes undue hardship, for individuals with disabilities. This includes physical changes to the facility, job restructuring, modified work schedules, reassignment of positions, acquisition or modification of equipment, appropriate adjustment of training, and the provision of assistance or interpreters. ADA also outlines nine categories of discrimination in order to keep equal opportunity for all individuals within the work environment.

ADA also has stipulations regarding accessibility in places of public accommodation such as lodging, food service, entertainment, public gathering, sales/rental, domestic service, transportation, public display, recreation, education, social service, and exercise. These facilities must remove barriers to access or provide a reasonable accommodation for access to the goods they provide unless it causes undue hardship to the facility. This refers to architectural changes as well as rules and policies (Kornblau, 2013).

## **Ghana**

### *General background and prevalence of disabilities*

Ghana is a developing nation in southern Africa with a population of approximately 25,000,000 people (World Factbook, 2014). According to Human Rights Watch, one fifth of the country's population has been registered with Social Welfare as having a disability; this fraction of the population is most likely underestimated due to individuals not registering as benefits and medical services are not guaranteed to be delivered (Yeoman, 1998). Common diagnoses resulting in long term disability within Ghana includes motor vehicle injuries, spinal cord injuries, cerebral palsy, polio, amputations, and unknown injuries potentially resulting from farming occupation.

### *Health care programs and funding for mobility devices*

The human rights of persons with disabilities are not well communicated to the national government; this results in a shortage of funding, resources, and opportunities. In 2006, 75% of the Ghanaian population participated in a "pay as you go" health care plan, rendering the purchase of mobility technology fiscally impossible for most of the population whose average income is \$300 (U.S.) a year (Tinney et al., 2007). The country is heavily reliant on international charity organizations and medical missionaries in order to provide rehabilitative services to

individuals with disabilities. Non-government organizations (NGO), such as Disability Options Ghana, provide some resources for rehabilitation services and assistive devices, such as wheelchairs, within certain communities. These organizations include both international charity and non-profit organizations with therapists in the country.

### *Types of mobility devices*

The benefits of mobility technology in Ghana align with the universal goal of mobility devices; the use of mobility devices allows individuals to be upright and engaged in meaningful occupations and social activities. Most mobility devices utilized in Ghana are provided by missions or non-governmental organizations. Common devices used range from homemade wooden crutches to expensive donated wheelchairs. One common wheeled mobility device is a hand powered tricycle that requires arm movement to propel and a three wheel base of support. This device could be made from a modified bike frame, three bike wheels, and gear system for the hand crank (Tinney et al., 2007). Some donated mobility devices also utilize simple materials- for example, the Rotary Club donates inexpensive wheelchairs made from bike tires, plastic lawn chairs, and a metal frame. The downside of many of these budget mobility options is that the materials comprising the chairs can cause negative complications. Pressure ulcers are difficult to prevent when the chair seat is made from plastic and can prove fatal for the wheelchair user (Burns & O'Connell, 2012). The overall goal of the mobility device provision seems to be quantity over quality; the goal of providing functional mobility devices to people seems to be providing more individuals with inexpensive quick solutions functional mobility rather than provide fewer individuals with well-fitting functional mobility.

### *Environmental effect on mobility*

Environmental factors contributing to the use of wheeled mobility include not only barriers in the rural lifestyle and terrain, but also the accessibility and safety of urban areas. Leading causes for long term disability in urban areas are motor vehicle crashes and pedestrian injuries; rural causes of long term disability included motor vehicle accident, in addition to lacerations from farm equipment and native environment (Mock et al., 2003). Having environmental barriers like heavy urban traffic are dangerous because they are also leading causes for injury and barriers to transportation within the community (Damsere-Derry et al., 2010). Unpaved roads and drainage gutters along rural highways create difficulty for persons with disabilities outside of the urban sphere. There is no legislation in effect to promote universal design for buildings and homes, rendering many public locations inaccessible for wheelchair users.

### *Cultural stigma regarding individuals with disabilities*

Disability in Ghana has long been seen as a consequence for immoral behavior or spiritual punishment which can lead to community isolation (Yeoman, 1998). Because of this negative stigma, individuals with disabilities and their families will avoid seeking medical and rehabilitative services or vocational opportunities within the community (Tinney et al., 2007). Many individuals become beggars due to stigma as well as a lack of opportunities available to persons with disabilities (Yeoman, 1998). Although begging can be a source of income for individuals with disabilities and their family, it should not occur because of limited employment opportunities available to persons with disabilities.

### *Overall accessibility in Ghana and comparison to USA norms*

- High poverty level has a large effect on personal mobility device obtainment and necessary home modifications. Ghana has pay as you go system rather than third party reimbursement.
- Community access is limited by lack of road shoulder or pathway easily accessible by individuals using personal mobility devices. Physical barriers such as drainage gutters in villages and a lack of universal design concepts makes public facilities difficult to access. In the US, ADA dictates reasonable accommodations that should be made to places of public accommodation in order to prevent discrimination by inaccessibility.
- Main devices used are the wheelchair, three wheeled hand bike, and wooden crutch/staff. These devices may be challenging to use when navigating rural communities due to uneven terrain (Kringle, personal communication, 2014) (Yeoman, 2007). Hand bikes are a large device and may be challenging to use in urban areas due to crowds and business entrances not being accessible for device.
- Cultural stigma views disability as a negative quality and this affects individuals' access to employment and social inclusion within a community. United States cultural stigma is more accepting of persons with disabilities but there is still some discrimination present and this can limit job opportunities available to individuals with disabilities.

## **Bangladesh**

### *General background and prevalence of disabilities*

Bangladesh is located in southern Asia and has a population of 160,000,000 people. Forty-four percent of the country's population lives below the poverty line with inadequate health, education, social security services, low employment and live in areas that are at a high risk for natural disasters, particularly flooding. The portion of people at high risk for natural



disasters includes many of the 16,000,000 individuals with disabilities or roughly 10% of the population (WHO, n.d.).

### *Health care programs and funding for mobility devices*

Some people in Bangladesh do have assistive mobility devices that are produced or refurbished in the country, but there is a very small percentage of the people who could afford to purchase a device or receive therapy services that could educate them on device use (personal communication Lindstrom, 2014). There is currently one rehabilitation center in Bangladesh, Center for the Rehabilitation of the Paralyzed (CRP), that is working to expand their geographic locations throughout the country (Center for Rehabilitation of the Paralyzed, n.d.). There is still a need for continued assistance from outside imports. One main concern regarding wheelchairs produced in Bangladesh are the poor quality of chairs; many of the chairs are not able to withstand the environmental factors associated with device use in Bangladesh.

### *Types of mobility devices*

Some manual wheelchairs are used in Bangladesh. The bicycle wheels and plastic lawn furniture are also common for people who are not able to afford their own wheelchair or receive a donated wheelchair. There are also wheeled trollies that are used at CRP to get people off of their buttocks due to pressure sores and lay on their stomach and propel themselves with the large tires that they can reach with their hands. Type of mobility is heavily dependent on the individual's resources.

CRP also does adaptive seating for some of the more involved people with cerebral palsy (Lindstrom, personal communication, 2014). Wood is commonly used to provide trunk support or pommels. CRP has a specialty seating clinic, but very few people who could potentially benefit from this service are able to receive it due to a lack of resources.

### *Environmental effect on mobility*

The environmental barriers to mobility accessibility are not limited to uneven terrain on unpaved roads but also include a lack of universal design concepts in regards to the layout of public and private buildings. Lack of awareness or regard for persons with disabilities has caused expanding urban regions to present additional challenges for users of mobility devices. This has resulted in increased social isolation and marginalization from the community for individuals with disabilities (Center for Rehabilitation of the Paralyzed, n.d.).

### *Cultural stigma regarding individuals with disabilities*

Popular belief for the occurrence of disability in Bangladesh is that disability is consequence for families angering deities or breaking spiritual traditions (Center for Rehabilitation of the Paralyzed, n.d.). The general cultural stigma towards individuals with disabilities, regardless of a belief in divine punishment, is that community inclusion is not a societal priority and meaningful occupation is not a human right (Lindstrom, personal communication, 2014). This belief is reflected in the attitude of the government which in turn causes no increase in inclusion within the work field, factories or public programs (Center for Rehabilitation of the Paralyzed, n.d.). Many of these facilities would not be accessible even if there was no discrimination- most factories do not have the space for device access and have physical barriers at entry.

### *Overall accessibility in Bangladesh and comparison to USA norms*

- Severe weather affecting the country creates challenges for community access, primarily during monsoon season. Deep ruts form in the roads and heavy flooding can occur which makes much of a community accessible only by boat during the monsoon season. The United States roadways and community walkways are generally paved and sloped to prevent flooding, public transportation must be handicap accessible thus severe weather does not generally serve as a barrier to access within the USA.
- Places of public access and homes are not easily accessible for mobility devices due to physical barriers of steps and raised entryways (sometimes built specifically with steps to avoid flooding during the monsoon season. In the United States, new places of public accommodation are required by ADA to have entrance options accessible by personal mobility devices, and this is not a legal requirement in Bangladesh.
- Financial status is a barrier for many individuals because although therapy services and devices are available in country, the majority of the population with a disability lives below the poverty line and cannot afford these services.

## **Guatemala**

### *General background and prevalence of disabilities*

Guatemala has population of 15,000,000 people where children and adolescents compose more than half of the population and 60% of the population is indigenous (Archilla et al., 2012). Guatemala has a large population of persons with disabilities but an exact number cannot be defined due to many people's failure to register and a misunderstanding of what

constitutes a disability. The National Disability Council estimates that somewhere between 12-14% of the Guatemalan population has a disability. In recent years, Guatemala has been making action towards increased inclusion; in 1996 they approved the Law for Integral Attention to Persons with Disabilities which would provide protection of social, economic, and cultural rights. However, there is still a need to address the lack of opportunities and basic human rights for persons with disabilities, especially those below the poverty line.

#### *Health care programs and funding for mobility devices*

Currently 20% of population lacks effective health services, and less than 60% has some kind of health coverage. For every 1,000 people in Guatemala, there is 0.09 physicians (Archila et al., 2012). In addition to the shortage of medical professionals, extreme poverty is a major economic crisis. Consequently, health care services are difficult to secure and most of the population goes without traditional medical treatments or surgery. Pay as you go healthcare plans are more popular in Guatemala than complete coverage packages but they create fiscal barriers for the majority of the population looking to access mobility devices. International charity or non-governmental organizations provide some rehabilitation services for families and individuals with disabilities (Saetermoe et al., 2004).

#### *Types of mobility devices*

Similarly to other developing countries, most mobility devices used in Guatemala are provided through non-government organizations or missions programs. Types of mobility devices are widespread including crutches, canes, wheelchairs, and push carts. Due to the large population of children and adolescents, many individuals with physical impairments do not have mobility devices because they are small enough to be carried by family. If the only transportation option is being carried by a family member, then opportunities for education, employment, and social interaction are severely limited.

#### *Environmental effect on mobility*

The largest environmental barrier for persons with disabilities in Guatemala is transportation within the community. This barrier is impacted by the public transport system, terrain, and lack of accessible pathways along roads or in urban regions. In addition to the challenges of public transportation, the hilly and unpaved terrain of rural villages presents a challenge for personal mobility devices. Even when a wheelchair is provided there is no guarantee that the person using a wheelchair will be able to successfully travel on the dirt roads and enter an individual's home.

### *Cultural stigma regarding individuals with disabilities*

Interview based studies regarding cultural stigma and disability in Guatemala have mixed results. Some studies indicated that families are strong advocates but are financially unable to acquire desired resources (Archila et al., 2012), whereas one study found that parents avoided sending their children to school because of the shame (Saetermoe et al., 2004). Overall, the varied responses suggests a mixed viewpoint that most likely varies by community and family situation.

### *Overall accessibility in Guatemala and comparison to USA norms*

- Families are generally primary caregivers and can control accessibility to community. This is similar in the USA where families are responsible for care, whether they assist personally or arrange care or both (Saetermoe et al., 2004).
- Main personal mobility devices include wheelchairs and wooden crutches. Most are received from charity organizations due to expensive “pay as you go” health care system. The United States has health care programs through third party insurance that will cover the cost of specific personal mobility devices but the type of device is limited.
- Poorly maintained sidewalks in urban areas and physical barriers to places of public accommodation due to lack of governmental standards, resources, and monetary assets.
- Low income neighborhoods lack access by even terrain causing many individuals to become isolated in their homes. In the United States, many people in low income housing live in shared housing complexes such as apartments, trailer parks, or affordable neighborhoods. These homes do not always meet ADA standards but are required to have options for persons with disabilities, such as an apartment on the first floor level.
- Most public transportation is inaccessible for wheelchair users, especially “chicken buses” which are repurposed school buses that travel between villages and to Guatemala City. The cost of what people can afford can limit the accessible options available for them, many people cannot afford the limited transportation options that are accessible for mobility devices. US public transportation is generally accessible but public transportation is fairly limited in most suburban and rural areas.

### *Case study*

Jorge is a 12 year old boy who sustained an incomplete SCI at the mid thoracic level. He had some sensation in his lower extremities but no voluntary motor function below the level of injury. Injury was sustained at age 10 while playing with friends at a community park. His family was unable to afford a corrective surgery, only the more affordable option of placing a rod

at the injury site. As a result of this surgery and muscle atrophy, Jorge has poor postural support laterally. Jorge was fit for a wheelchair by an international charity organization and was also able to obtain school sponsorship by the organization. Although the organization pays by the month for school tuition, Jorge was unable to attend school because his family has told him it is “too difficult to get him there”. His mother is a single mother with three other children and has become unable to take him to school due to work; Jorge is unable to propel himself due to uneven terrain and physical barriers associated with leaving his home and entering school. Jorge is now isolated from social interaction with peers and deprived of an education due to inability to independently access his community. His teacher is willing to tutor him over the summer session if she is paid by the organization but there is a strong chance that the organization could lose funding for his case if Jorge’s family is not compliant with continuing his education. Jorge’s challenges go beyond the need for a mobility device- even with a wheelchair he is unable to access his community and participate in meaningful occupations.

## **Discussion**

### *Rehabilitation professionals in developing countries*

There is a large need for rehabilitation professionals in Ghana and Guatemala, including occupational therapists and physical therapists as only 1-2% of persons with disabilities in the developing world receive rehabilitative services (Tinney et al., 2007). Mobility devices are being provided or obtained through programs and healthcare systems but many of these organizations are non-profits or missionary services and the number of in-country therapists offering affordable care remains very low. Rehabilitation professionals would not only be able to assist in fitting a device but would also have a positive effect on overall universal design of buildings and community accessibility for mobility devices. The majority of therapeutic professionals in Bangladesh are employees of the Center for the Rehabilitation of the Paralyzed and although this resource facilitates the availability of rehabilitation services, high poverty rates are a barrier for many individuals to receive equipment. Although therapy services and devices are available in country, the majority of the population with a disability cannot afford these services.

### *Accessibility trends*

The economic, environmental, and cultural factors surrounding disability in the U.S., Ghana, Bangladesh, and Guatemala had an effect on how communities were accessible for

mobility devices. The stability of a country's economy affects accessibility because it impacts the amount and type of resources available for the improving of device accessibility. Financial resources are one concern for developing countries with high poverty levels such as Ghana, Bangladesh, and Guatemala. It can be assumed through a shortage of legislation and implemented accessibility solutions that mobility device accessibility is not seen as a primary concern by the governments who are financially stressed. The United States has avenues to promote accessibility, such as ADA, but the implementation is not necessarily widespread due to the potential for required accommodations causing to undue hardship on the place of public accommodation.

Having national legislation or financial resources does not necessarily mean that a country is more accessible. In the United States, ADA does not directly specify that accessible entrances, bathrooms, elevators, etc. need to be conveniently located for use in public facilities. Although there are options for accessibility, their location could be a barrier for a person with low endurance or difficulty with topographical orientation; overall the ease of access can be questionable for a person using a mobility device. In Ghana, one main accessibility barrier was the lack of road travel when using a mobility device- drainage gutters and lack of road shoulder made travel between and within town difficult. Bangladesh accessibility was primarily affected by environmental factors, such as monsoon season, limiting accessibility options for persons utilizing mobility devices. Flooded areas require boat travel and areas that are unpaved may remain un-flooded, but will develop ruts in the road which negatively impact accessibility. Guatemala's primary challenge regarding accessibility is public transportation. Additionally physical barriers of stairs and raised entrances are a problem as many homes and buildings are off the ground level due to rain. Many persons with disabilities are isolated in their homes because there is no safe, efficient, or affordable way to access their community without the assistance of their family.

In the US, ADA does not cover private buildings; therefore homes are not required to be accessible for mobility devices. However, some private homes and residential living offer accessibility solutions such as the implementation of universal design concepts. Home accessibility is barrier for persons with disabilities in developing countries because the construction and environment of the home may prevent ease of access. Many homes have step entrances and no solution for entering or leaving the home for those using a mobility device. Many persons with disabilities in developing countries live so deep in poverty that they live on the street or sidewalk, negating the barrier of home entrance but suffering from lack of resources and safety.

Cultural stigma can be a barrier to mobility accessibility as it affects community awareness of necessary disability accommodations and norms of care. In the US, there is

mandated equality for persons with disabilities but there are still barriers of discrimination, such as a lack of acceptance in the workforce. In Ghana, disability is seen by some as a result of bad spirits and this results in community isolation from social inclusion and employment. Cultural barriers in Bangladesh and Guatemala mainly revolve around the limitation of care opportunities. Family is generally responsible for initiating community access by transporting the person with a disability and this not only puts hardship on the family by also can increase isolation for the person with a disability.

## **Analysis**

The unique aspects of each country's economy and culture shape the way mobility devices are obtained and used, as well as stigmatized based on society's acceptance level towards persons with disabilities. The culture has an effect on how people with disabilities, including those with wheeled mobility devices, are stigmatized by society; it shapes the purpose and value others expect them to bring to the community as a whole. Environmental factors affect the use of the device within the home and community. The type of mobility technology used is not only determined by diagnosis but also by various contextual factors. The shortage of financial means, rehabilitation professionals, and health care services in developing countries has led to lack of access to mobility devices and improper use or fit for most individuals who are able to obtain mobility technology.

The need for improvement in developing country's mobility device accessibility goes far beyond a need for more personal mobility devices. Many developing countries are in need of political advocacy and community education on universal design and disability prevalence. Rehabilitation professionals need to be trained in country not only to provide services at an individual level but also to be a knowledge resource to advocate and help encourage acceptance and decrease barriers in order to increase community opportunities. Literature and published case studies would be a good method to bring the need for mobility, as well as current challenges for mobility device users, to public awareness. The more awareness regarding functional mobility and the importance of developing accessibility standards, the more likely that there will be decided action to improve the use of personal mobility devices in developing countries.

## **Results**

### *Comparisons and trends*

It was universally agreed among sources found that approximately 10% of the global population had a diagnosed disability. The characteristic of widespread poverty in developing countries creates economic complications on both a governmental and personal level. The government does not have the funding or resources to provide rehabilitative and medical services to the rising population of individuals with disabilities. The majority of the population lives below the poverty and does not have access to health care services or they are unable to meet the “pay as you go” plans. Financial restraint also has an effect on the accommodation options in private or public buildings. Cultural stigma was generally negative or indifferent towards persons with disabilities which increased marginalization and social isolation. Additionally, discrimination in the workforce limited opportunities for persons with disabilities, leaving workplace accessibility for mobility devices generally unaddressed. High potentials for severe weather- such as monsoons or flooding- restricts accessibility and use of mobility devices and increases social isolation. Sources also highlighted that in addition to the terrain challenges associated with mobility device accessibility, lack of universal design concepts within the community created a large environmental barrier to functional mobility. Ultimately, the larger issue beyond the shortage of mobility devices is a lack of accessibility solutions within these developing countries in order to promote occupation, social acceptance, and employment.

### *Limitations*

The primary limitation affecting the reliability of this literature review was the shortage of published literature available on the use of mobility technology in developing countries. There are many therapists who have been to developing countries short term to provide mobility devices; there are not many researchers who have published statistical findings regarding mobility and accessibility or case studies from developing countries. In order to increase the validity and reliability of this literature review, more academic material would need to be cited in order to support the personal experiences and interviews given by educated therapeutic professionals

### *Conclusion*

There are contextual factors affecting the use of mobility devices in developing countries, including economic, environmental, and cultural factors. Economic factors shared by Ghana, Bangladesh, and Guatemala are financial instability and limited legislation promoting accessibility and opportunities for persons with disabilities. Environmental factors include physical terrain and limitations in community transportation and building accessibility. Cultural barriers include the varying cultural stigmas associated with disability and their effect on employment opportunities and social inclusion within a community.



In the three developing countries, extreme poverty is a barrier for access to health care, personal mobility devices, and the ability for individuals and communities to make necessary modifications for increased accessibility. The United States has a more stable health care and stronger economy, resulting in more health coverage throughout the country. The federal government provides coverage for specific personal mobility devices through programs like Medicare Part B and Medicaid. All of the developing countries have a shortage of rehabilitation professionals which affects the quantity of mobility devices used, the quality of device fit, and communicated need for increased community mobility options. Although there is a demand for rehabilitation professionals in the United States, there is a better ratio of therapist to population. Additionally the growing number of rehab professionals advocating and increasing knowledge regarding the need for their services increases the acknowledgement of a need for universal accessibility. Finally, negative cultural stigma in the three developing countries affects opportunities for employment and social inclusion and could have some play in the lack of increase in community accessibility standards. The United States has passed legislation to minimize the discrimination and stigma for individuals with disabilities and has legislation, such as ADA, in place so that discrimination and inaccessibility does not become a barrier. This increases the opportunity for the pursuit of meaningful occupations.

Disability prevalence in developing world is at 10% of the world population and therefore many potential users of mobility devices are living in countries where there are barriers to functional mobility. Economic, environmental, and cultural barriers impact how devices are obtained and used. These barriers prevent accessibility for mobility devices and impact social inclusion and community access, as well as employment opportunities. Overall, change in the developing world is necessary and financial resources and in country rehabilitation professionals are required in order to provide mobility devices to those who would benefit from them and adapt communities and homes to increase accessibility and expand the potential for occupation for persons with disabilities in developing countries.

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